Metals Review
THE NEWS DIGEST MAGAZINE

Volume XXV - No. 1 January, 1952

Plan Now to Attend

A.S.M. MIDWINTER MEETING

William Penn Hotel, Pittsburgh, Pa.

January 31 and February 1, 1952

Timely and important problems in high-temperature metallurgy, titanium, and other aspects of strategic metal conservation and substitution will be threshed out before the Midwinter Meeting of the American Society for Metals in Pittsburgh. Scientific and physical metallurgy of these problems will be treated in the 17 technical papers to be presented during the two-day session. All of the papers have been preprinted in accordance with the list published in the October issue of *Metals Review*.

Decision to hold a midwinter meeting as a supplement to the annual meeting at the National Metal Congress in October was made by the Board of Trustees as a means of handling the large number of meritorious papers that are now being submitted to the A.S.M. Publications Committee. All of the papers will be published in the 1952 volume of the A.S.M. *Transactions*.

An opportunity to hear these papers personally presented and to participate in the discussion adds immeasurably to their value to the individual. Likewise, the meeting will provide invaluable contacts with speakers and other experts in attendance. All A.S.M. members are cordially invited to attend.

MAKE YOUR ROOM RESERVATION
DIRECT TO THE HOTEL, ADDRESSING
WILLIAM PENN HOTEL, PITTSBURGH
and Specifying That You Will Attend the Midwinter Meeting of the American Society for Metals, Jan. 31 and Feb. 1, 1952

AMERICAN SOCIETY FOR METALS

Metals Review

THE NEWS DIGEST MAGAZINE

VOLUME XXV, No. 1 **JANUARY, 1952**

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DEPARTMENTS

ASM REVIEW OF METAL LITERATURE

Midwinter Meeting in Pittsburgh Schedules 20 Technical Papers on Original Research

Five technical sessions are scheduled for the two-day Midwinter Meeting of the American Society for Metals, to be held in Pittsburgh on Jan. 31 and Feb. 1. A national meeting of the Society, supplementing the annual meeting held during the National Metal Congress each October, the Midwinter Meeting is expected to attract a large number of A.S.M. members, scientists and engineers interested in the timely subjects that will be presented.

Twenty papers detailing the results of original research are scheduled to be presented on Thursday morning, afternoon and evening, and Friday morning and afternoon. A special dinner on Thursday for those attending the meeting is an added feature.

All of the papers for these sessions have been preprinted and will be published in the 1953 edition of the A.S.M. *Transactions*. They will be grouped for presentation according to subject matter. Topic of the Thursday morning session is "Titanium and Titanium Alloys"; Thursday afternoon, "Embrittlement"; Thursday evening, "High Temperature and Oxidation"; Friday morning, "Nonferrous Alloys"; and Friday afternoon, "Transformations and grain growth". The complete program was published in the December issue of *Metals Review*, page 10.

The lead-off paper on the titanium session will explore the titanium-vanadium system with a view to formulating alloys with a high melting point and heat resistance. Authors of the paper, H. K. Adenstedt, J. R. Pequignot and J. M. Raymer, all of Wright - Patterson Air Force Base, said their investigations represent a single phase of an extensive research program sponsored by the United States Air Force.

The titanium-chromium and titanium-iron systems are investigated in the second paper, which will be presented by scientists of Armour Research Foundation. The Ti-Cr-Fe alloys are among the first important titanium-base alloys to find commercial applications. W. P. Roe of National Lead Co. and W. P. Fishel of Vanderbilt University will also have a paper on the Fe-Ti-Cr system, while Morton and Baldwin of Case Institute will report on the scaling of titanium in air.

The afternoon session on embrittlement will include a contribution on temper embrittlement in plain carbon steel—a material generally believed in the past not to exhibit this phenomenon. Evidence is presented to indicate that the mechanism of the reaction is associated with carbon diffusion or carbide formation rather than nitride formation as initially proposed.

Newly developed dilatometers which measure dimensional changes in metal parts of aircraft engines to tolerances of 0.00005 in. will be described in the first paper on the Thursday evening high-temperature session. The instrument was developed in the Naval Research Laboratory, Washington, D. C., and will be described by W. R. Apblett and W. S. Pellini. Two additional papers on the session will deal with high-temperature oxidation problems with Ni-Cr-Fe alloys and with Inconel.

Aluminum, brass, hafnium and zirconium are the metals selected for attention on the nonferrous session Friday morning. Of the two papers on aluminum, one will give recommendations for improvement of fatigue strength by alloying, particularly with zinc; the second will tell how creep resistance can be improved, also by alloying.

No A.S.M. program would be complete without having a go at the basic metallurgical topic of transformations in metals and their resulting structures, and the Midwinter Meeting winds up with four such papers on Friday afternoon. The first describes an electrical resistance apparatus for studying transformations in stainless steels. The second, by John Chipman and his staff of steel melting experts at M.I.T., deals with transformations in the molten condition—a field relatively neglected by other investigators. Specifically, this paper deals with solubility of carbon in molten iron and in iron-silicon and iron-manganese alloys.

Two papers on grain growth complete the program—one by George Wiener of Westinghouse Electric Corp., on grain growth in high-purity iron, and the second by G. W. Wensch of Fansteel Metallurgical Co. and H. L. Walker of University of Illinois on grain growth and recrystallization of nickel.

Co-chairman of the sessions are as follows:

Thursday Morning (Titanium): B. W. Gonser of Battelle Memorial Institute and T. E. Piper of Northrop Aircraft, Inc.

Thursday Afternoon (Embrittlement): J. E. Dorn, University of California; B. R. Queneau, United States Steel Co.

Thursday Evening (High Temperatures): A. W. F. Green, General Motors Corp.; H. C. Knerr, Metlab Co.

Friday Morning (Nonferrous): J. B. Johnson, Wright-Patterson Air Force Base; R. L. Templin, Aluminum Co. of America.

Friday Afternoon (Transformations): R. H. Aborn, United States Steel Co.; A. J. Herzig, Climax Molybdenum Co.

Headquarters for the meeting will be the William Penn Hotel, Pittsburgh. Reservations should be made direct with the hotel.

Induction Hardening Techniques Discussed

Reported by Donald R. Mathews
Allen-Bradley Co.

The November meeting of the Milwaukee Chapter A.S.M. featured a technical discourse by Homer F. Kincaid, assistant works metallurgist of the Farmall Works of International Harvester Co. Mr. Kincaid has had considerable experience in research and production programs involving the induction hardening of gears. He discussed the techniques employed and gave details on preheating, heating, and oil and water quenching.

An interesting moving picture was also presented which clearly showed many induction hardening applications in Harvester plants. A lively question and answer session followed.

The Coffee Talk was a demonstration lecture on the operator-toll-dialing system which may eventually permit telephone subscribers to dial any long distance number in the country. The talk was presented by J. S. Day of the Wisconsin Telephone Co.

Left: Ralph Webb of the Milwaukee Chapter Executive Committee, and (Right) Homer F. Kincaid of International Harvester Co., the Speaker. (Photograph by Mark Wallesz)

Ralph Wilson Cites Timely Data on Substitute Steels

Reported by George F. Sommer
Metallurgist, Link-Belt Co.

Timely data on substitute steels were included in the National Officers' Night address of the Indianapolis Chapter on Nov. 19. The speaker was Ralph L. Wilson, director of metallurgy, Timken Roller Bearing Co., Canton, Ohio.

Mr. Wilson began his lecture on "Recent Development in Alloy Steels" with a review of temper brittleness phenomena. He presented data on the effect of tempering time on the transition temperature, and noted effects from differences in steelmaking practice.

How effect of boron on hardenability diminishes with increasing carbon content was illustrated by data from U.S. Steel Research Laboratories. The maximum effect of boron on a 13B21 series appears at about 0.6% carbon. At 1.2% carbon there is little or no difference between 1321 and 13B21. The top carbon content in the case of a carburized boron steel must be controlled to insure maximum hardenability in the case, Mr. Wilson pointed out. Hardenability can also be improved by adjusting both the carbon content and the austenitizing temperature.

One of Mr. Wilson's slides showed extensive data on the effect of manganese content on some seven different steels—both boron-treated and regular alloy steels. Lowering of nickel and molybdenum contents reduces the effectiveness of manganese in improving hardenability. Thus, if nickel and molybdenum are to be conserved, more manganese is required, but it also is in short supply. Moreover, manganese higher than about 0.75% has an adverse effect on machinability of many as-rolled low-carbon alloy steels because of the presence of martensite in the microstructure.

Normally, Mr. Wilson explained, metallurgists try to select the proper alloy steel with carbon and alloy content adjusted so as to avoid tempering in the brittle range. However, the present steel situation limits the choice so sharply that the speaker believes that for many engineering applications metallurgists should be satisfied with a fibrous fracture without worrying too much about the actual impact value.

Previous to Mr. Wilson's technical talk, National Secretary Bill Eisenman presented a glowing account of interesting experiences in connection with the World Metallurgical Congress in Detroit. He also brought the members up to date on the progress made by their national organization during recent years.

Central Group at the Speakers' Table for Indianapolis Chapter's National Officers' Night Included H. J. Fletcher of E. F. Houghton & Co., Chapter Chairman; W. H. Eisenman, National Secretary; R. L. Wilson, A.S.M. Vice-President and Technical Speaker of the Evening; and J. D. Duncan of Link Belt Co., Chapter Secretary. (Photo by York)

Versatile Applications of Al Require Numerous Grades

Reported by R. E. Lorentz, Jr.
Combustion Engineering-Superheater, Inc.

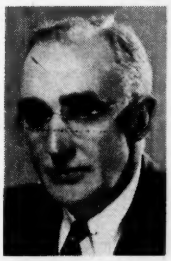
Many alloys of aluminum are required to fill its versatile applications, W. B. Heilman, chief metallurgist of Aluminum Co. of America at Alcoa, Tenn., told the Chattanooga Chapter A.S.M. on Nov. 13. Mr. Heilman traced the factors behind the evolution of many of the grades.

His talk also covered the general nomenclature systems used in the aluminum industry and dealt in some detail with the characteristics and uses of various representative alloys. The cladding principle is used to obtain various combinations of characteristics not otherwise obtainable.

A long question-and-answer period followed the presentation of this fundamental information, including a great deal about aluminum production and fabrication. Fred Conrad of the Atlantic office and A. M. Miller of the Massena, N. Y., plant of Alcoa, also contributed to this phase of the program.

Pioneer Detroit Steel Treater Retires From Chrysler Corp.

A metallurgical engineering career of more than a third of a century, spanning metallurgy's foremost strides in modern industry, has ended in retirement for Edward W. Upham, 65, of Chrysler Corp.'s engineering division.



E. W. Upham

In 1913, when young Upham was graduated from the University of Michigan, the industry was just beginning to emerge from the cut-and-try methods of the early 1900's. He went to work at the Highland Park (Mich.) plant for the Maxwell Motor Co. as the lone metallurgist among a dozen laboratory employees in a corner of what is now Chrysler's road test garage. When Chrysler Corp. was formed in 1925, he remained with the new company as chief metallurgist.

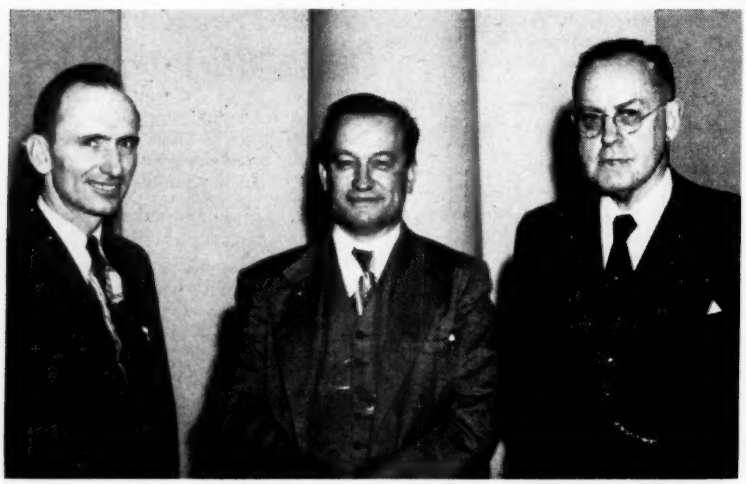
The expansion of engineering research has been especially impressive in the field of metallurgy, according to J. C. Zeder, Chrysler Corp. vice-president, who announced Mr. Upham's retirement. Mr. Zeder is also director of engineering and research.

Winning acceptance of engineering controls back in the 'teen years of the automotive industry was a gradual process. In addition to serving as a trouble shooter, Upham set up production processes. He could apply to heat treatment some of the theory he had learned from Prof. A. E. White at the University because the foreman, Edward Jackson, welcomed such cooperation.

Evidence of the mutual respect which developed between metallurgist and foreman was the fact that Jackson invited Upham to join the newly formed Detroit Steel Treaters Club as soon as technical men were admitted. In recognition of the club's expanded interests, its name was changed to the Steel Treating Research Society. This Detroit group was an ancestor of the present American Society for Metals. Upham wrote a technical paper in 1916 on "Phases of Tempering" which was published in the society's proceedings.

In the early days, engineers had to be versatile, and Mr. Upham was also active in the Society of Automotive Engineers. In 1948, when he finished his 20-year term as chairman of the S.A.E. Fuels and Lubricants Technical Committee, the Society, its technical board and the Fuel and Lubricants Committee paid tribute to him in a joint resolution.

Wise Choice of Strategic Alloys Urged



Walter Carroll (Right), Special Metallurgical Engineer, Republic Steel Corp., Spoke on Strategic Metals at the Mahoning Valley November Meeting. Left is Chester Robards, chief inspector, Cadillac Tank Plant, and center, Donald Babcock, metallurgical engineer, Republic Steel Corp., technical chairman. (Photo by Henry Holberson)

Reported by Eugene M. Smith
Development Metallurgical Engineer Youngstown Sheet and Tube Co.

With the exception of molybdenum, the United States is dependent on outside sources of supply to meet present consumer demands for metals. Walter Carroll, metallurgical engineer of Republic Steel Corp., outlined the status of strategic metals before the Mahoning Valley Chapter on Nov. 13.

Present production of alloy steel has not reached the tonnage record achieved in 1943. Hence, the metallic elements used in alloy steel production are going to remain scarce. The scrap shortage will necessitate additional conservation and salvage measures if steel production is to be increased as planned, Mr. Carroll maintained.

Manganese, chromium, cobalt, and columbium are particularly in short supply. Since they are imported, it is especially necessary to utilize wisely the amount on hand.

Open-pit nickel ores are being depleted rapidly. With increasing ratio of underground mined nickel, it can only be expected that the metal will become more expensive to produce. Demand is currently 2½ times the available supply. This is true of molybdenum as well as nickel.

In the nonferrous field, the supply picture is no brighter, the speaker asserted. Copper, lead, tin, and zinc are in very short supply. In addition, the world price is more attractive to foreign producers than the domestic fixed price. As a result, the normal flow of metal to our shores has been disrupted. The temporary shortage of aluminum and magnesium, although serious, will be somewhat modified by our country's ability to expand production to process ores available in the western hemisphere.

With such a dark picture of metal supply, it becomes the responsibility of the metallurgist to educate the consumer in the wise choice of alloys so as to prevent waste through misapplication.

Save Alloys by Determining 'Par' for the Job—Knowlton

Reported by A. D. Carvin
Joslyn Mfg. & Supply Co.

Boron is not considered as an alloying element in the same sense as other alloys, according to Harry B. Knowlton, supervisor of materials engineering, International Harvester Co. Rather, it promotes depth of hardening by the effect it has on nucleation, he explained in a talk on "Boron Steels" before the Fort Wayne Chapter A.S.M. on Nov. 12.

With the substitution of boron steels for alloy case hardening steels, it may be necessary to redesign parts because of greater warpage or higher local internal stresses. Also, experimentation may be required to establish the proper heat treatment to be used on the boron steels with the available equipment. However, in the heat treating grades, substitution of boron steel on the basis of equivalent hardenability should cause little or no change in heat treatment.

In the present emergency, Mr. Knowlton emphasized, it is imperative that manufacturers find suitable substitutes for the alloy steels they may be using now. Some manufacturers have a tendency to criticize the government or a political party for cuts in their alloy consumption, whereas actual alloy shortages are the real culprit. As Mr. Knowlton ably put it, find out just what is "par" for the job. The country that makes its critical elements or alloys go the farthest toward the mostest will win the hot or cold war.

Stories of Research on "The Unusual Metals" Open New Possibilities

Reported by
Chas. W. Alexander, 3rd
Metallurgist, Henry Disston & Sons, Inc.

Stories of research at Battelle, highlighting the intense interest in "The Unusual Metals" were recounted before the October meeting of the Philadelphia Chapter A.S.M. by Bruce W. Gonser of Battelle Memorial Institute.

The widespread use of a metal depends upon its abundance in the earth's crust, its availability and ease of recovery, and its properties, he said.

Many of our "common" metals are in very low supply in the earth's crust, but their availability and ease of recovery have led to their widespread use. Slides illustrated the relative abundance of the metals, and Dr. Gonser discussed various recovery methods, including the recovery of certain metals from plant life.

Of the unusual metals, the speaker pointed out that the alkaline earth metals are handicapped by their active reaction with moisture despite their relative abundance and useful physical properties. Developments among the brittle metals, such as chromium and bismuth, are along the line of increasing their ductility. The ductility of bismuth wire was demonstrated.

Semi-conductors such as silicon, germanium and gray tin have useful and interesting electrical properties. Other unusual metals surveyed were the soft metals—indium, thalium and gallium—and the high-melting-point metals, with emphasis on tungsten, rhenium, tantalum and molybdenum.

The possibilities offered by metallic and oxide coatings, and the whole vast, undeveloped coating field, were duly stressed. As an example, Dr. Gonser demonstrated the properties of silicon-coated molybdenum as an electric heating element, and illustrated various coatings with slides.

A buffet dinner enlivened with baseball lore, as related by Lena Blackburne of the Philadelphia Athletics, preceded a report of the National Metal Congress and the World Metallurgical Congress, its activities and accomplishments.

Pittsburgh Carnegie Lecture Deals With Means of Increasing Steel Production

Reported by W. W. Brown
Assistant Chief Metallurgist
Homestead Works, U. S. Steel Co.

The Fourth Annual Andrew Carnegie Lecture of the Pittsburgh Chapter A.S.M. was presented on Oct. 11 by Francis L. Toy, assistant to the manager of research and development, United States Steel Co. Mr. Toy's long experience in the steel industry was recognized in the invitation to present a lecture on "Some Phases in the Process Metallurgy of Steel."

Problems now confronting the industry with regard to raw materials were outlined by Mr. Toy. He stressed the importance of conserving high-grade ores by developing beneficiation methods for the low-grade ores.

The use of lean ores has been generally avoided because of high silicon content, which is undesirable from both the blast furnace and open-hearth standpoints. Methods are now being developed to treat certain low-grade ores on a basis which will supply a material of reasonably uniform and high iron content economically. At the same time vast reserves of usable ores, commonly known as taconites, will be released to industry.

Beneficiation of such ores is dependent upon the mineralogical composition of the gangue materials. One ore type may contain magnetic iron oxide; another may consist of simple minerals which may be separated by more or less simple treatment; while a third type may be composed of complex minerals, the separation of which is much more difficult. Beneficiation of the taconites may be accomplished by gravity concentration, flotation, or magnetic separation.

In the not too distant future, beneficiated taconites may constitute a considerable percentage of blast furnace ores, Mr. Toy predicted. The use of such concentrates may prove to be most economical, because of lower slag requirements, better fuel efficiency, and increased production attributable to higher-density material. High blast temperatures might be possible, which would provide more heat units, save coke, and increase stock flow rates. A reduction in flue dust is also anticipated.

Coke quality is important in the production of iron, the speaker pointed out. Since one basic function of coke is to help maintain an open burden, its strength is of great importance. Ash and sulphur content must also be regulated.

Approximately 87% of steel produced in the United States is made is the openhearth. Fuel control is of utmost importance in this phase of steel production. The heat units necessary to melt the charge, preheat the air and support oxidation of the elements in the bath must be controlled closely. Increased production has resulted in increased firing rates, and a current need is for refractories that will withstand such rates, Mr. Toy pointed out.

Another control necessary in the production of openhearth steel is of sulphur content. The removal of sulphur depends greatly upon the amount of silicon in the metallic charge, the iron oxide in the charge and the amount of flux charged. Slides were presented showing data obtained on sulphur balance studies conducted in various openhearth shops. Since high silicon content of the charge is so undesirable in the production of low-sulphur steel, methods of iron desiliconization are being developed in several countries.

Rate of steel production may be increased by more rapid supply of heat and by intimate contact of reacting elements. The combination of the best features of each of these two factors into the new "turbo-hearth" process was discussed briefly.

Mr. Toy concluded his paper with a tribute to Andrew Carnegie. M. W. Lightner, chairman of the Chapter, presented Mr. Toy with a certificate commemorating the occasion.

Arthur B. Wilder (Left), Retiring as Pittsburgh Chapter Head, Receives Past Chairman's Certificate From New Chairman Lightner

Francis L. Toy (Left) Receives Carnegie Lecture Commemorative Certificate From Pittsburgh Chapter Chairman M. W. Lightner

Mahoning Lecture Course Is on Statistical Control

A course of four lectures on "Statistical Quality Control Techniques" is currently being offered by the Mahoning Valley Chapter A.S.M. Purpose of the lectures is to help fulfill the increasing demand for knowledge and use of quality control techniques as a tool to help solve some of the complicated problems that confront us every day.

The course is open to all interested, whether A.S.M. members or not. No registration fee is required. The schedule is as follows:

Jan. 15—Some Basic Fundamentals of Quality Control; H. C. Dunkle, Quality Control Engineer, Republic Steel Corp., Youngstown, Ohio (director of the course).

Jan. 22—Construction and Use of Quality Control Charts; H. H. Johnson, Chief Metallurgist, National Malleable and Steel Castings Co., Sharon, Pa.

Jan. 29—Probability—Its Application in Quality Control Techniques; R. F. Cain, Assistant Superintendent, Quality Control, Republic Steel Corp., Canton, Ohio.

Feb. 5—The Mysteries of Multiple Correlation Revealed; D. S. Leckie, Quality Control Engineer, Republic Steel Corp., Cleveland.

The lectures are held at the Student Center, Youngstown College, from 7:30 to 9:00 p.m.

The first part of the Chapter's educational program was completed on Nov. 27 and consisted of three lectures on "The ABC's of Iron and Steel". E. J. P. Fisher, metallurgical consultant and metallurgical lecturer at Youngstown College, was the lecturer.

Ten Years Ago

Quotes From *Metals Review*
January 1942

"Chicago Chapter—The November meeting was designated as Past Chairmen's Night. Those honored were ADAM STEEVER, WALTHER MATHESIUS, MARC GROSSMANN, HARVEY ANDERSON, HARRY KNOWLTON, E. GAMMETER, W. REMMERS, H. VAN VLEET and ROY ROSHONG. Chairman W. D. MCMILLAN presented each one with an appropriate gift."

Chicago Organizes Student Group at Illinois Institute

Organization of a student group of the Chicago Chapter A.S.M. has recently been completed at Illinois Institute of Technology. The new group is the result of a project undertaken by the Student Affairs Committee of the Chapter under the chairmanship of B. S. Myers, chemical research engineer, International Harvester Co.

A preliminary investigation made by this committee in October revealed that the Chicago Chapter had 32 junior members. Most of them had very little contact with the Society, and a letter directed to all 32 elicited only six replies. Inquiring as to why these members had joined but apparently were not interested in the Society, the Committee discovered that most of them believed the only benefit they could derive from the Society was the opportunity to purchase Metals Handbook at a reduced rate.

This information prompted action. With the approval of the Executive Committee of the Chicago Chapter, plans were made to contact students at Illinois Institute of Technology—the principal local institution that furnishes courses with a major in metallurgical engineering. Illinois Tech had approximately 79 students eligible for junior membership in A.S.M. A noontime meeting was arranged with these students to acquaint them with the advantages of A.S.M. membership, and refreshments were served. Of the 70 students invited, 60 came to hear the members of the Student Affairs Committee explain the benefits of A.S.M. This meeting resulted in 45 new junior memberships.

Organization of the group with its own officers is at present under way. Meetings will be held on the campus at Illinois Institute of Technology. Members of the Chicago Chapter will cooperate actively in furnishing speakers and seeing that subjects are selected which the faculty advisors deem of most importance.

B. C. Chairman Reports On Detroit Congress

Reported by Walter J. Chappell
Vivian Engine Works, Ltd.

The November dinner meeting of the British Columbia Chapter A.S.M., featured an account by Chapter Chairman Frank Cazalet of his recent trip to the 33rd National Metal Congress and Exposition and the first World Metallurgical Congress held in Detroit in October. Mr. Cazalet served as an official American conferee to the World Congress, represented the British Columbia Chapter, and was sponsored by the B. C. Electric Railway.

Since Mr. Cazalet is concerned with the manufacture of domestic gas, he visited several gas plants during his travels, namely, Peoples Gas, Light and Power Co. of Chicago, Michigan Consolidated Gas Co., and the Toronto Gas Co. He described some of their operations, as well as the propane gas storage tanks he inspected.

The speaker then briefly outlined an unsettled debate which came to his attention. J. R. Mott, chief metallurgist, Canadian Acme Screw and Metal Co., maintained that gear strength can be reduced 40% by grinding. L. P. Tarasov, metallurgist for Norton Co., on the other hand, stated that airplane engine gears are ground for close tolerance. The discussion was inconclusive.

Mr. Cazalet also had occasion to hear of some of the experiences of F. J. Robbins, president of Sierra Drawn Steel Co., on his recent trip to Europe. Many of the newer European plants, he said, are self-sufficient. For example, a shipyard may manufacture all, or nearly all parts, including the engine.

At the annual Canadian Luncheon the Montreal chairman presided and National Vice-President John Chipman was guest speaker. Mr. Cazalet made arrangements for the B. C. Chapter to preside at the 1952 luncheon in Philadephia.

Features of New Boeing Gas Turbine Illustrated

Reported by J. V. McMaster
Metallurgist, General Electric Co.

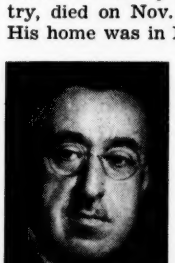
In an interesting talk supplemented by slides and a 16-mm. color movie, W. L. Slosson, metallurgist for the Boeing Project, described the revolutionary new Boeing 502 gas turbine before the November dinner meeting of the Columbia Basin Chapter A.S.M.

More than 50 members and guests heard his description and illustration of metallurgical problems related to usages of metals at high temperatures and under extremely corrosive conditions. Applications of alloys containing such metals as columbium, tantalum, tungsten, cobalt, chromium and nickel, in various combinations, were of particular interest to the metallurgists present.

Facing the Camera at the November Dinner Meeting of the Columbia Basin Chapter A. S. M. Are G. L. Flint, Chapter Chairman; R. G. Wheeler of the Executive Committee; A. F. Markel, Technical Chairman of the Meeting; W. L. Slosson, the Speaker; B. R. Elder, Secretary; J. V. McMaster of the Executive Committee; and O. J. Wick, Vice-Chairman of the Chapter

Fred Griffiths Dies After Long Career In Steel Industry

Frederick J. Griffiths, 73, nationally known authority in the steel industry, died on Nov. 23 in Philadelphia. His home was in Massillon, Ohio, and he had been a long-time member of the Canton - Massillon Chapter A.S.M. In 1948 he was presented a "Distinguished Service Award for Meritorious Contributions to Progress in Alloy Steel" by the American Society for Metals. The citation was based on "his influence in the early development of the alloy steel business in America".



F. J. Griffiths

Mr. Griffiths first came to Canton as a chemist with the old Central Alloy Steel Co., which later became Republic Steel Corp. In the period from 1913 to 1929 his positions ranged from general superintendent to president and general manager, and finally chairman of the board. He was president of Republic Steel from 1929 until 1932, when he joined the Timken organization as president of Timken Steel Co.

He was next appointed executive vice-president of Copperweld Steel Co. and had charge of the newly created alloy steel division at Warren. In 1941 he retired from active participation in the steel industry but remained as a director and consultant to Copperweld.

Mr. Griffiths was closely associated with Benjamin Fairless, president of U. S. Steel. Mr. Fairless was a protege of Mr. Griffiths and their friendship and association continued through the years.

THIRTY YEARS AGO

The first anniversary of the amalgamation of the American Steel Treaters Society and the Steel Treating Research Society into the American Society for Steel Treating was celebrated at the third annual convention in Indianapolis in September 1921. The Society then boasted 31 chapters and 3200 members.

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W. R. CHAPIN, chairman of the Executive Committee of the Indianapolis Chapter (then director of the testing department, E. C. Atkins Co., Inc., now director of research for Atkins and recipient of the Sauveur Achievement Award in 1936), presented the address of welcome.

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GEORGE DESAUTELS, president of the Imperial Drop Forge Co. (now operating his own company in Indianapolis), demonstrated true Hoosier hospitality as chairman of the entertainment committee. The program included a smoker, dance, banquet, intercity tennis and golf tournaments, and a memorable event never since repeated at an A.S.M. annual meeting. This was a 50-mile match race at the famed Indianapolis Speedway between several Frontenac, Duisenberg and Chevrolet automobiles.

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Classic photographs in the October 1921 issue of *Transactions* show such dignitaries as National President A. E. WHITE, President-Elect F. P. GILLIGAN, and Secretary W. H. EISENMAN seated in the pacemaker car which started the race.

— 30 —

Says H. H. HARRIS of Q-Alloys fame, an early and staunch A.S.M. booster, in his advertisement in the same issue: "The Indianapolis Chapter who wrote, staged and directed the show, have made Indianapolis a larger spot on the industrial map and its name synonymous with Hospitality."

Doubtless the reason the 1921 convention was the only one to be held in Indianapolis is because the Society forthwith outgrew the facilities of the exposition hall and never returned to the status of a mere 70 exhibitors.

— 30 —

Some 80 technical papers were presented in Indianapolis. Ten of the authors were destined to serve as future A.S.M. national presidents—namely, A. H. D'ARCAMBAL, J. P. GILL, W. P. WOODSIDE, H. J. FRENCH, M. A. GROSSMANN, T. D. LYNCH,† W. E. JOMINY, R. M. BIRD,† O. E. HARDER, and A. E. WHITE, the president at that time.

— 30 —

R. L. DOWDELL, then instructor of metallography at University of Minnesota, now head of the department of metallurgy and currently national treasurer of the Society, was also an author on this program.

†Now deceased.

Stamm Addresses Golden Gate

Reported by C. E. Freeman

C. E. Freeman Co.

The regular monthly technical meeting of the Golden Gate Chapter A.S.M. was held on Nov. 12 at El Curtola Restaurant in Oakland, Calif. Approximately 90 members and guests heard an informative talk on "Manufacture of Forgings" by F. L. Stamm, vice-president in charge of operations for General Metals Corp., and vice-chairman of the Los Angeles Chapter A.S.M. Mr. Stamm described the processes used in the forging industry, with special emphasis on forging requirements to meet aircraft specifications.

Westinghouse Fellowships At Carnegie Tech Offered To Teachers of Science

Between 20 and 40 fellowships—each valued at $250—will be awarded to secondary school science teachers who will participate in a special six weeks' summer program at Carnegie Institute of Technology. The 1952 fellowships are provided by the Westinghouse Educational Foundation.

Throughout the program emphasis is placed on teaching methods in which the Carnegie Plan of Professional Education is featured.

According to A. C. Monteith, vice-president of Westinghouse Electric Corp. and chairman of the Educational Foundation, "the role of the secondary school science teacher is becoming increasingly important. If industry is to maintain a steady flow of competent engineers and scientists, then it must give all possible support and encouragement to the teachers in secondary schools."

Application forms and further information about the summer program can be obtained from the Director of Admissions, Carnegie Institute of Technology, Pittsburgh 13, Pa.

Stagg Appointed Director of Training for Crucible; Was Early A.S.M. Official

Howard J. Stagg has been appointed director of training for Crucible Steel Co. of America. Mr. Stagg, who for the time being will make his headquarters in Syracuse, N. Y., will be responsible for the organization, planning and direction of training programs in all Crucible departments at all levels.

He began his career with Crucible as a chemist at the Sanderson Works in Syracuse. After working as laboratory assistant in the metallurgical department at the Halcomb Steel Co. in Syracuse, he became company metallurgist in 1913. In 1921, he was appointed assistant plant manager. Mr. Stagg was transferred to the toolsteel division when it was organized, and in 1950 he was given charge of the sales training program.

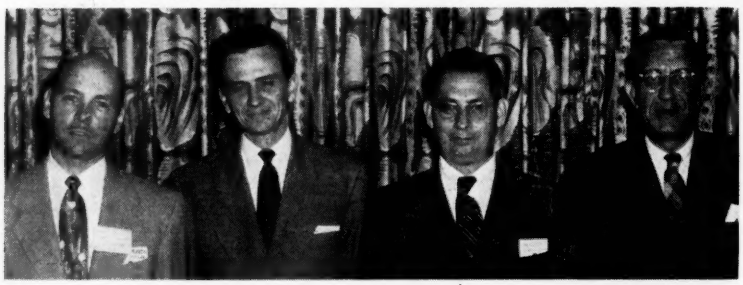
Howard Stagg was vice-president of the Steel Treating Research Society when that body was merged with the American Steel Treaters Society to form the American Society for Steel Treating (later renamed the American Society for Metals). He was a member of the first Board of Directors, and helped write the first constitution of the Society. In 1948, Mr. Stagg received the "Distinguished Service Award" from the A.S.M., as a "lifelong proponent of the intelligent use of alloy steel, who influenced practices in many producing and consuming industries".

He has long been active in professional society activities, and served on the Iron and Steel Division of the Society of Automotive Engineers in the early days when the present numerical system of S.A.E. steels was being developed.

During the last war, Mr. Stagg served as a member of the Board of Economic Warfare. He was graduated from Columbia University in 1909 with the degree of Chemical Engineer.

Howard Stagg Shown Addressing the Detroit Chapter Last May on the Occasion of "Old-Timers' Night"

Metallographic Technique Explained



At "Young Fellows' Night" of the Chicago Chapter A. S. M. Were Braly S. Myers of International Harvester Co., Chairman of the Student Affairs Committee of the Chapter; Dennis J. Carney, Technical Chairman of the Meeting; J. R. Vilella, Principal Speaker; and E. L. Roff of United States Steel Co. South Works, Chairman of the Program Committee

Reported by Vernon R. Scott
Metallurgist, Acme Steel Co.

The purpose and necessity of metallographic technique was explained for the benefit of the "young in experience" who attended the "Young Fellows' Night" meeting of the Chicago Chapter A.S.M. in November. J. R. Vilella of U. S. Steel Research Laboratory was the speaker.

"What we see or photograph through the microscope is the result of the combination of the material in the specimen and the preparatory technique." According to the speaker, "the best technique is that which modifies the material least in the preparation." He then listed six main points to be considered in developing a technique that approaches this desired result most closely.

Electropolishing is useful in producing this desired freedom from disturbed material, but the same results are frequently obtainable by repolishing on the finest wheel and re-etching, repeating these two steps until true structure is revealed. This technique, however, is not effective on austenitic stainless steels, which must be electropolished, Mr. Vilella pointed out.

Picral is preferable to nital as an etchant, in the speaker's opinion, since the latter is sensitive to variations in orientation of constituents and may produce a false structure. He has also found picral to be very sensitive to variations in chemistry.

Mr. Vilella presented some excellent rules for the metallographer to follow in the photography of the prepared specimen.

The speaker expects an increasing use of ultraviolet micrography. Such light sources are easily produced and have high resolving power, he said. Furthermore, ultraviolet rays are easily transmitted by glass lenses, and this leads to economical lens production.

In the field of electron microscopy, the greatest advantage is the extreme degree of resolution possible. Use is limited, however, because of the smallness of the aperture and somewhat complicated technique involved in the production of replicas of specimens. It is very easy to be deceived by the appearance of a poorly prepared replica!

Mr. Vilella feels that possibly the accessory that adds the most to the usefulness of the light-type microscope is the human finger. This results from its use to interrupt an axial beam of light and produce conical light to reveal the degree of relief between different constituents.

In closing, the speaker emphasized the importance of using monochromatic light as nearly as possible. No instrument can be corrected 100% for chromatic aberration, he pointed out. Mr. Vilella also recommended more attention to the use of reflective-type objectives that utilize a system of mirrors instead of lenses to avoid loss of light in transmission by the lens system.

D. J. Carney, chief development metallurgist, South Works, United States Steel Co., acted as technical chairman. The audience included a group of junior members attending Illinois Institute of Technology.

LaQue Gives Marburg Lecture

Reported by E. R. Stauffacher
Southern California Edison Co.

The Marburg Lecture was presented before a joint meeting of 550 members of various technical societies in Los Angeles on Nov. 8. Frank LaQue of International Nickel Co. delivered the lecture on "Corrosion and Corrosion Control". Participating societies were the Los Angeles Chapter of A.S.M., the A.S.T.M., N.A.C.E., A.S.C.E., A.I.E.E., A.I.M.E., and A.I.Ch.E.

The meeting was held at the Rodger Young Auditorium and was preceded by a dinner. After the lecture an interested audience participated in discussion on various aspects of corrosion control.

Milwaukee Course Treats Metallurgical Problems Of Emergency Materials

"Metallurgical Problems of Emergency Materials" was the subject of a series of five evening lectures in the 19th educational course of the Milwaukee Chapter A.S.M. The series was completed on Nov. 26 with an average attendance of 243. The schedule of meetings was as follows:

Oct. 29—Why Emergency Materials, by D. I. Brown, Technical Editor, *Iron Age*. A description of raw materials needed in the manufacture of alloy and stainless steels, sources of supply and availability of such raw materials, past, present and future; the drain of certain critical metals or alloys by various industries.

Nov. 5—Low-Carbon (Carburizing) Alloy Steels, by L. E. Webb, Chief Metallurgist, Clark Equipment Co. A comparison of new boron-type alloy steels with older, well-known S.A.E. grades. Hardenability, machinability, weldability, formability, heat treating characteristics and limitations of the boron steels; typical applications.

Nov. 12—Medium (0.30 to 0.60%) Carbon and Spring Alloy Steels, by J. V. Russell, Metallurgical Laboratory Director, Republic Steel Corp. Hardenability characteristics of spring steel compositions that have been introduced to conserve critical alloy elements; basic mechanical properties obtainable related to processing necessary with the new steels. Possible departures from these basic relationships, as a result of certain alloy deletions. Production experiences with typical applications.

Nov. 19—Nonferrous Alloys, by John F. Klement, Chief Metallurgist, Ampco Metal, Inc. (for cast alloys), and S. P. Snyder, Technical Advisor, Revere Copper & Brass, Inc. (for wrought alloys). Critical material shortages and substitutions, and the effect on physical and mechanical properties, machinability, formability, and heat treating characteristics. Effect of residual elements on casting and fabricating properties.

Nov. 26—Application of Emergency Materials From the Engineering Viewpoint, by H. B. Knowlton, Materials Engineer, International Harvester Co. Specific applications of emergency materials with emphasis on laboratory and field test results.

Certificates for 100% attendance records were presented to 102 of those who registered for the course.

E. T. Champlin of Allis-Chalmers Mfg. Co. is chairman of the Educational Program Committee.

DON'T MISS—
A.S.M. Midwinter Meeting
William Penn Hotel, Pittsburgh
Jan. 31-Feb. 1, 1952

Explains How Chip Form Is Used as Machinability Index

Reported by R. C. Pocock
Chief Engineer
Engineering Research Laboratory
Bendix Products Div.

"Machinability" was the subject presented by E. A. Hoffman of the LaSalle Steel Co. of Chicago, before the Notre Dame Chapter A.S.M. for the first meeting of the 1951-52 season. Mr. Hoffman first gave a brief survey of the basic factors affecting machinability, and then discussed the application of these basic facts to shop practice.

The three basic factors affecting machinability are the work metal, the tool and the chip. Since machining is nothing more than the production of chips, their form is an index of the quality of machining being practiced.

Three types of chips are produced:

1. The discontinuous chip is formed with brittle materials, small rake angle, slow speed, and is a heavy chip.
2. The continuous chip is formed with ductile material, thin cuts, large rake angle, and sharp tools, and is the ideal set of conditions toward which good practice should strive.
3. The continuous chip with built-up edges is a result of inability of the metal to flow freely along the tool face. This the more common set of conditions found in shop practice. Roughness of surface finish is a result of built-up chip edges.

The process of cutting is, in practice, a process of plastic flow. As a tool enters and cuts, the metal being machined deforms in compression and escapes by friction along the tool face. This is the more common set of harder than the cut from the workpiece. Thickness is determined by the shear plane angle. Large shear angles produce thin chips, and small shear angles produce thick chips. The cutting ratio R_c can be expressed by equations involving thickness of cut and thickness of chip and also length of chip.

Machining properties that determine machinability are the machining constant C, shear strength in cutting, and coefficient of friction between the tool and chip. Shear strength changes with compression forces. These factors act at the tool face and the plane of shear.

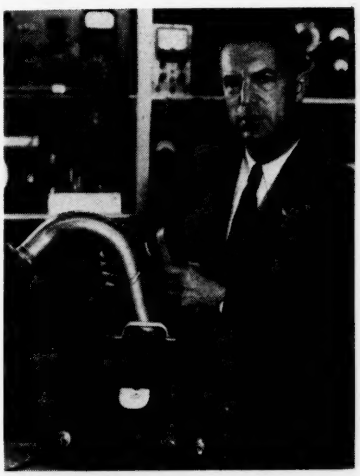
Material properties that affect machinability are the metal hardness, strain hardenability, and hard inclusions in the metal.

For improvement in shop practice Mr. Hoffman made the following recommendations: Machine with the thinnest possible chip, where R_c approaches 1. Feed and speed should be controlled. Maximum feed produces the least heat and longer tool life. Decreasing the rake angle decreases the coefficient of friction.

Polish tool faces for longer life. For the most parts in the least amount of time, use sharp cutting angles and heavy feed, adjusting the speed for best tool life under the particular set of conditions. Control surface finish by machining to a continuous chip with as little edge build-up as possible.

Speed has a greater effect on surface finish than either rake angle or feed. The ideal conditions must, of necessity, be compromised. In some cases a combination of positive and negative rake angles will produce better efficiency and tool life.

Demonstrates Tester



Bernard Gross, Director of Laboratories, Rohr Aircraft Corp., Demonstrates a "Mapy" Indicator at the November Meeting of the San Diego Chapter A.S.M. Magnetic permeability, as indicated by Mapy, is used to determine whether or not parts formed from annealed stock must be re-annealed and to segregate hard forms of stainless steel sheet stock prior to critical forming. (Reported by Major Frank H. Page, Process Engineer, Rohr Aircraft Co.)

Twenty Years Ago

Quotes From *Metals Review*
January 1932

"On Jan. 1, 1932, A. H. D'ARCAMBAL, consulting metallurgist and sales manager of the Pratt & Whitney Co., Hartford, Conn., [now a vice-president] went into office as president of the American Society for Steel Treating. . . WILLIAM B. COLEMAN, president of W. B. Coleman & Co., Philadelphia, assumed office as vice-president, and ARTHUR T. CLARAGE, president of Columbia Tool Steel Co., Chicago as treasurer."

Titanium Exploited as Nonstrategic Metal

Reported by F. R. Morral
Head, X-Ray Diffraction
Division of Metallurgical Research
Kaiser Aluminum & Chemical Corp.

"Titanium—Metal of the Future" was the subject of an address to the Inland Empire Chapter A.S.M. on Nov. 27 by L. W. Eastwood, assistant director of the metallurgical research division of Kaiser Aluminum & Chemical Corp.

Large supplies of ore on this continent make titanium nonstrategic, Dr. Eastwood pointed out. This widespread availability constitutes an important reason for the interest in this engineering material. It combines highest strength-weight ratio with excellent corrosion resistance.

The speaker mentioned the trend in the titanium industry for chemical and metal producers to combine with steel and stainless steel fabricators. Thus, joint companies are formed to develop techniques and markets for titanium and its alloys.

Sources, metal production by experimental and commercial methods, melting techniques, continuous casting of titanium ingots, and projected prices of metal and fabricated parts were discussed in succession. Fabrication methods were compared with those current in the industry.

Dr. Eastwood corrected the fallacy of some prevailing concepts of contamination due to high temperatures. He described the properties of iodide titanium, commercial titanium, and some of the titanium commercial alloys, as well as the metallography and alloying characteristics of some elements.

Dr. Eastwood gave examples of uses and possibilities. Titanium may give competition to the light metals and some of the heavier well-known structural materials in certain applications, he concluded.

Silver Anniversary Celebrated

Reported by J. B. Given
International Business Machines Corp.

Charter members were honored guests of the Southern Tier Chapter at the 25th Anniversary Meeting on Nov. 12. Seven of the original group of 20 were present.

National Secretary Bill Eisenman presented the chapter with an illuminated scroll in commemoration of its silver anniversary. Mr. Eisenman also spoke briefly of the educational aims of the Society.

Speaker of the evening was W. E. Jominy, staff engineer of the Chrysler Corp. and A.S.M. immediate past president. His topic was "Applications of Hardenability". Mr. Jominy showed complete mastery of this subject, with a concise and interesting presentation.

Van Horn Succeeds Frary as Alcoa Research Director

Kent R. Van Horn, an A.S.M. past president, has been named director of research for Aluminum Co. of America. Dr. Van Horn succeeds Francis C. Frary, who is retiring.

K. R. Van Horn

All of Dr. Van Horn's professional career has been spent with Alcoa, starting in the Cleveland division in 1929 with the position of research metallurgist. At that time he had just received his Ph.D. degree from Yale University. At Case Institute of Technology, where he earned his Bachelor of Science degree in 1926, he was the only member of his class to receive three honor keys. His Master's degree was also received at Yale, where he was granted the Sterling Research Fellowship for further study.

Dr. Van Horn remained in the Cleveland research division of the Aluminum Co. until 18 months ago, when he moved to New Kensington as associate director of research.

He is co-author with George Sachs of the A.S.M. text on "Practical Metallurgy" and is now working on a book on the "Alloys of Iron and Aluminum", soon to be published. Seven years ago at the age of 39, he served as A.S.M. national president and was the youngest man ever to occupy this post. He is an authority on industrial X-rays, and was instrumental in founding the Society for Non-Destructive Testing.

Dr. Frary, the retiring research director, has held this position for more than 30 years. He was born in Minneapolis in 1884 and received his Master's degree in chemistry at University of Minnesota. After a year's study and travel abroad, he returned to continue his research and received his Ph.D. in 1912.

F. C. Frary

He taught for three more years and in 1915 was invited to take charge of the research laboratories of the Oldbury Electrochemical Co. in Niagara Falls. He went to Alcoa in 1918 as director of research.

Dr. Frary was awarded the Gold Medal of the A.S.M. in 1948, and last fall served as chairman of Group 2 of conferees to the World Metallurgical Congress. He is also the recipient of the Edward Goodrich Acheson Gold Medal of the Electrochemical Society and the Perkin Medal of the American Section of the Society of Chemical Industry. More than 30 patents have been issued to him for the development of various aluminum alloys and methods and equipment for processing and fabrication.

Technical Papers Invited for A.S.M. Transactions

The Publications Committee of the A.S.M. will now receive technical papers for consideration for publication in the 1953 *Transactions* and probable presentation before a national meeting of the Society. A cordial invitation is extended to all members and nonmembers of the A.S.M. to submit technical papers to the society.

Many of the papers approved by the committee will be scheduled for presentation on the technical program of the 34th National Metal Congress and Exposition to be held in Philadelphia, Oct. 20 to 24, 1952, or the Western Metal Congress in Los Angeles, March 23 to 27, 1953. Papers that are selected for presentation will be preprinted and manuscripts should be received at A.S.M. headquarters office not later than April 10, 1952.

Acceptance of a paper for publication does not necessarily infer that it will be presented at either of these conventions. The selection of approved papers for the convention programs will be made in early June. A preference for either of the two conventions should be indicated.

Manuscripts in triplicate plus one set of unmounted photographs and original tracings, should be sent to the attention of Ray T. Bayless, assistant secretary, American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio.

Headquarters should be notified of your intention to submit a paper, and helpful suggestions for the preparation of technical papers will be sent.

Students Become Embryo Metallurgists

An Outstanding Example of How a Local A. S. M. Chapter Can Stimulate Interest in Metallurgy Among Students in Secondary Schools Is Represented in This Picture of a Display Prepared by the Wyzalek Awards Committee of the New Jersey Chapter. Titled "Embryo Metallurgists at Work", it represents projects conducted by students under supervision of instructors in the manufacturing and technics department of the Essex County Vocational and Technical High School of Bloomfield, N. J. Included in the display are such items as a one-cent piece cold rolled on a mill designed and built by the metallurgy students; models of atomic structure of a steel molecule; metal powders and parts; forgings and machined parts; tensile, spark test and Jominy end-quench specimens; and similar items resulting from metallurgical investigations. (Reported by Henry F. J. Skarbek)

Definition of "Strategic Minerals" Broadened, Montreal Speaker Shows

Reported by J. S. Fullerton
Sales Representative, Eastern Canada Handy & Harman of Canada, Ltd.

Speaking on "Strategic Minerals" before the Montreal Chapter A.S.M. on Nov. 5, G. C. Monture of the Canadian Department of Defense Production in Washington, D. C., made it clear that the definition of "strategic" has changed. The word now refers to any minerals or metals required by free nations for employment, better living, or for defense. The former so-called strategic or scarce metals just take their regular places among all the metals of the world.

At the present time the military programs being pursued by the free nations call for a maximum of 20% of the stated requirements for metals. However, preparation for defense requires a great deal of additional metal, while increased expansion for new plants to produce metals requires still more and more metal, thus creating the present-day shortage. An International Metals Committee of 27 countries—all of them either major producers or consumers—is presently supervising and setting up methods of allocation of available metals, the speaker said.

Twenty years has seen a tremendous change from steels and heavy metals to the lighter aluminum and magnesium alloys. Jet warfare and atomic energy created new requirements for steel and the rare alloying elements of cobalt, chromium and others. The tremendous increase in the use of tungsten for mining drills is an outstanding example of this change, Dr. Monture stated. Molybdenum has become really scarce and substitutes are being sought. Titanium, while still in the experimental stage, promises to rank high among the "quantity" metals.

Canada's position in the metals field shows an excellent supply of the base metals. Special metals for alloying are imported, and the speaker reviewed in some detail their origin and availability. Recent discoveries in Canada have made available domestic supplies to the Canadian consumer.

Dr. Monture then briefly reviewed the world's position in metals. So long as there is no war—and with adequate shipping—there will be a few shortages. However should defense requirements increase significantly, drastic shortages must develop. Substitutions and conservation measures will help and may avert actual shortages, but war would certainly be a metals problem.

In concluding, Dr. Monture appealed to metallurgists and metal consumers to help by research and technical skills to solve the present problem.

Technical chairman for the evening was Prof. G. M. Sproule of McGill University. A review of the National Metal Congress and the World Metallurgical Congress was given by G. M. Young, technical director, Aluminum Co. of Canada, who, as chairman of the Montreal Chapter, was the official delegate to Detroit. Through the courtesy of the Aluminum Co. of Canada, a film entitled "Nechako Survey" was shown for the coffee talk period. It portrayed preliminary work on the power plant required for the aluminum smelter now building in British Columbia.

Welding Fellowships Available

Two fellowships in metallurgy, each with an annual value of $3500, are available at Rensselaer Polytechnic Institute for graduate students who wish to pursue advanced work in seam and spot welding.

The fellowships have been established by the Welding Research Council of New York City, and are to be awarded through Ernest F. Nippes, who directs welding research at the Institute. Applicants for the fellowships should get in touch with Dr. Nippes. Work may be started as soon as an award is made.

New Bearing Alloys Have Improved Load-Carrying And Surface Qualities

Reported by T. G. Thurston

Sales Engineer, Bryant Industrial Div. Affiliated Gas Equipment, Inc.

Babbitt metal, discovered by Isaac Babbitt in 1839, is still the best bearing material in every way except load-carrying capacity, according to Edwin Crankshaw, chief engineer, Cleveland Graphite Bronze Co. Mr. Crankshaw addressed the Cleveland Chapter A.S.M. on Nov. 5.

To improve this characteristic, he explained, modern babbitt bearings are composed of a very thin layer of babbitt (0.002 to 0.005 in. thick) chemically bonded to steel backs. This reduction in babbitt thickness improves bearing life many fold.

To improve load-carrying characteristics, bronze, copper-lead, aluminum, silver, and other alloys have been developed. While fatigue resistance is thus substantially increased, surface quality is reduced so that hardened shafts are required for satisfactory performance. More recently, the surface characteristics of copper-leads have been improved by a precision plated copper-lead-tin overlay 0.001 in thick. This overlay helps immeasurably during break-in, operates as the bearing material for a long period of time, and when it finally disappears it has adapted itself to conditions of assembly and operation so that the bearing will continue to operate satisfactorily on the high fatigue resistant copper-lead.

Silver as a bearing material has excellent fatigue and corrosion resistance, but relatively poor surface action. Modern silver aircraft bearings are all plated with a thin lead overlay to which indium is added for corrosion resistance.

The exact place aluminum will have in bearings is at present not clear. Aluminum alloys show definite promise in certain applications because of good fatigue resistance and virtually no corrosion tendencies. However, surface action still leaves something to be desired.

As engine makers have stepped up speed and engine output, the need for maintaining lower oil temperatures has become increasingly important, since fatigue resistance and oil film thickness both fall off rapidly with higher operating temperatures. This situation has placed additional emphasis on adequate oil circulation and distribution, achieved by oil spreader grooves in the bearings and proper horizontal and vertical clearances between bearing and journal. By the use of eccentric wall thickness in a bearing, the vertical clearance is kept at a minimum to reduce bearing noise, while the horizontal clearance can be opened up to insure adequate oil flow.

Bearing "crush" in half-bearings, similar to a pressed-fit, is obtained by making each half-bearing a little longer than the half-circle case bore into which it must fit. This "crush" results in a high radial pressure between bearing back and bore and insures good heat transfer, proper running clearance and general stability of bearing position during operation.

The proper maintenance of a hydrodynamic oil film between bearing and journal was emphasized. Typical bearing failures were illustrated with slides and their distinguishing characteristics pointed out. The clew to correction of bearing troubles is frequently to be found in proper interpretation of failed bearings from the field, Mr. Crankshaw concluded.

Ten Years Ago

Quotes From *Metals Review* January 1942

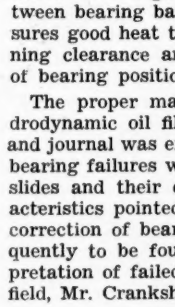
"Predicts That Moly High Speed Steels Will Remain After Emergency" [headline on a report of a talk before the Ontario Chapter by H. J. STAGG of Crucible Steel Co. of America.].

♦ ♦ ♦

"The first Rockwell hardness tester to be built and sold has been presented to the A.S.M. for the Sauveur Memorial Museum through the courtesy of C. H. Wilson, president of Wilson Mechanical Instrument Co., manufacturer of the tester."

Named Division Chief in Canadian Mines Branch

Norman C. MacPhee, metallurgist with the Mines Branch, Department of Mines and Technical Surveys, Ottawa, Canada, has been selected by the Civil Service Commission as chief of the division of physical metallurgy. He succeeds John Convey, who recently became branch director.



N. C. MacPhee

As head of the division of physical metallurgy, Mr. MacPhee will direct a program of industrial and fundamental research projects and will be responsible for collaboration with the Canadian metal industry. He is a past chairman of the Ottawa Valley Chapter A.S.M.

Mr. MacPhee has had a long and varied career in the foundry and metallurgical industries of both Canada and the United States. Before coming to the Bureau of Mines in 1941, he was employed by McKinnon Industry at St. Catherines, Ont. Prior to that he worked with the Century Electric Co., St. Louis, Mo.; Auto Specialties Mfg. Co., St. Joseph, Mich.; Campbell, Wyant and Cannon Foundry Co., Muskegon, Mich., as well as other leading foundries in the U. S. A native of Westmount, P. Q., he is a graduate of Queens University in Kingston, Ont.

He is a director of the Eastern Canada Chapter of the American Foundrymen's Society, and is the author of numerous publications on various phases of foundry practice.

IMPORTANT MEETINGS

for February

Jan. 28 — Feb. 1 — Institute of the Aeronautical Sciences. 20th Annual Meeting, Astor Hotel, New York. (R. R. Dexter, Secretary, I.A.S., 2 East 64th St., New York 21, N. Y.)

Jan. 31—Feb. 1—American Society for Metals. Midwinter Technical Meeting, William Penn Hotel, Pittsburgh. (W. H. Eisenman, Secretary, A. S.M., 7301 Euclid Ave., Cleveland 3, Ohio.)

Jan. 31—Feb. 2—Colorado Mining Association. American Prospectors and Developers Conference of Metal Producers, Denver, Colo. (Robert S. Palmer, Executive Director, C.M.A., 204 State Office Bldg., Denver 2, Colo.)

Jan. 31—Feb. 2—American Physical Society. Annual Meeting, Columbia University, New York. (Alice Clifford, A.P.S., 57 East 55th St., New York 22, N. Y.)

Feb. 18-19—National Association of Aluminum Distributors. First Annual Meeting, Drake Hotel, Chicago. (Raymond L. Collier, Executive Secretary N.A.A.D., Cleveland.)

Feb. 18-21—American Institute of Mining & Metallurgical Engineers. Annual Meeting, Hotel Statler, New York. (E. O. Kirkendall, Secretary, Metals Branch, A.I.M.E., 29 West 39th St., New York 17, N. Y.)

Tulsa Metallurgists Answer Questions About Stainless

Reported by William L. Smith

Oklahoma Steel Castings Co., Inc.

Tulsa Chapter A.S.M. held a dinner meeting on Nov. 12 at Wynn's Cafe. A large attendance included many new members from Douglas Aircraft Co.

R. Grady Snuggs, professor at the University of Tulsa, provided the coffee talk entitled, "The Inescapable"—an interesting discourse on man's personality.

Following the coffee talk, a discussion was held on the use of stainless steel for immersion heaters in corrosive liquids. Chapter metallurgists were called upon to answer questions about stainless steel.

The Oklahoma Institute of Technology Extension Class in the Physical Metallurgy of Steel, which is sponsored by the Tulsa Chapter, was postponed so that class members might attend the meeting. The class is being conducted on a college credit basis, but will not be held on chapter meeting nights.

New Metallurgical Course At New York University; Aptitude Tests Introduced

A new metallurgical curriculum, placing increased emphasis on metal technology and physical metallurgy, has been instituted at the New York University College of Engineering.

The program started this year under the direction of John P. Nielsen, associate professor of metal science. Dr. Nielsen is a member of the A.S.M. Advisory Committee on Metallurgical Education.

During the freshman year, students interested in a metallurgical career are given a special interview to determine their aptitude for the field. The results of this interview are kept on file, and the data are reviewed during the student's senior year. Approximately one-third of the graduating seniors are then selected as potential "top metallurgists" and are offered special opportunities for advanced graduate study.

In the spring semester of the senior laboratory course each student will compete in the metropolitan section of a country-wide metallurgical contest sponsored for the past ten years by the American Institute of Mining and Metallurgical Engineers. The best report from this area dealing with an original metallurgical problem is submitted for national honors. Brooklyn Polytechnic Institute, Columbia University, Stevens Institute of Technology and New York University constitute the metropolitan group.

Temperature and Fluid Velocity Important Factors In Corrosion of Copper

Reported by Earle W. Lovering
Metallurgist, Seymour Mfg. Co.

The effect of five factors on "Corrosion of Copper-Base Alloys" was considered by C. L. Bulow, corrosion metallurgist for Bridgeport Brass Co., in an address before the New Haven Chapter A.S.M. on Nov. 15. These factors are (a) metal composition, (b) corroding medium, (c) temperature, (d) stress, and (e) fluid velocity. Of these factors, Mr. Bulow pointed out that temperature and fluid velocity are highly important, and discussed means of minimizing their effect.

The speaker showed photographs of samples which exhibited corrosion by pitting on only a short length of the tube where the fluid enters. This was caused by impingement on the ends of the tubes because of the higher velocity of the entering fluid.

This type of corrosion is being encountered more and more in condenser tubes and heat exchanger tubes where the fluids are being used at higher and higher speeds. Test data show that an aluminum brass tube and a 70-30 cupronickel tube with 0.5% iron are most resistant to this type of corrosion.

Excellent photographs and charts illustrated all types of corrosion, as well as means of testing corrosion resistance in laboratory and field.

Twenty Years Ago

Quotes From *Metals Review*
January 1932

"H. J. FRENCH, since 1929 a member of the research staff at the laboratory of International Nickel Co., Inc., in Bayonne, N. J., has been transferred to the development and research department in New York to take charge of development work in steel." [Now vice-president of Inco.]

Chipman at Purdue for National Officers' Night

Reported by J. M. Hoegfeldt
Haynes Stellite Co.

A.S.M. National President John Chipman addressed the Purdue Chapter A.S.M. at the Purdue Memorial Union on Nov. 13. The talk, given during Dr. Chipman's first trip to Purdue and his fifth chapter visit since taking the president's office, was entitled: "Meeting the Nation's Need for Metallurgists".

A spirited discussion led by G. M. Enos of Purdue's School of Chemical and Metallurgical Engineering, technical chairman, enabled the chapter members to give their views on the A.S.M. program for increasing the number of metallurgy students.

Japanese Metallurgy Described

"A Metallurgist in Japan" Was the Title of the Annual Sauveur Memorial Lecture Presented Before 150 Members and Guests of the Boston Chapter on Dec. 7. Robert S. Williams (Left), professor emeritus of Massachusetts Institute of Technology, is shown receiving the memorial photograph of Professor Sauveur from Paul Ffield, chairman of the Sauveur Memorial Speakers Committee. Dr. Williams, member of a mission on engineering education, described some of the metallurgical problems dealt with on his trip through the islands of Japan from Kyushu to Hokkaido, ending in Tokyo. Prof. Albert Dietz of M. I. T., another member of the mission, illustrated the talk with uncanny three-dimensional pictures. (Reported by John L. Morosini; Photograph by H. L. Phillips)

Gives Machining Lecture

Reported by Knox A. Powell
Research Engineer
Minneapolis-Moline Co.

Northwest Chapter A.S.M. held its regular monthly meeting in the Lodge Room of the Covered Wagon on Nov. 15. Elbert A. Hoffman, manager of metallurgical sales for LaSalle Steel Co., presented a synopsis of the five-lecture educational series that he gave last winter in Chicago.

The talk was illustrated with a large chip-tool model in contrasting colors coated to take explanatory vector diagrams in chalk. A series of giant chip formation micrographs and tool performance charts was displayed on an easel as the theme developed. Details of Mr. Hoffman's lecture are given in the Notre Dame Chapter report on page 11.

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"WELCOME TO NATION'S CAPITAL" . . . Reception for Overseas Conferees. Full Texts of Addresses by: GEORGE BENDER, Congressman-at-large from Ohio. HARRY FREER, Board of Trade and Greater National Capital Committee. C. E. STOTT, Director, Strategic Materials Division, E. C. A. DR. OLIVER E. BUCKLEY, Chairman, Scientific Division, Office of Defense Mobilization. DR. E. U. CONDON, Director, Bureau of Standards. DR. PIERRE VAN DER REST, General Manager, Belgian Blast Furnace and Steel Works Association. RAGHUNATH GOVIND BHATAWADEKAR, Metallurgist, Ministry of Railways, India.

"MEETING AT SUNIMOOR FARM" . . . Reception and re-creation of Pioneer Scenes on the Farm Home of W. H. Eisenman, Secretary, American Society for Metals.

"WELCOME TO DETROIT" . . Full Texts of Addresses by: Mayor ALBERT COBO; W. C. NEWBERG, President, Dodge Division, Chrysler Corporation; Governor G. MENNEN WILLIAMS of Michigan.

"OPENING SESSION OF THE WORLD METALLURGICAL CONGRESS" . . . World Metal Resources . . . Full Texts of Addresses: "Raw Material for Defense Metals in the Free World" by James Boyd, Administrator of Defense Minerals, U. S. Department of Interior. "Metals for Defense in the E. C. A. Countries" by Pierre Van Der Rest, General Manager, Belgian Blast Furnace and Steel Works Association. "Metals for Defense in the non-E. C. A. Countries of the Free World" by Clyde Williams, Director, Battelle Memorial Institute, Columbus, Ohio. "Defense Metal Conservation and Substitution" by K. P. Harten, Executive Secretary, Vereins Deutscher Eisenhuttenleute (German Iron & Steel Institute).

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PHOSPHORUS DEOXIDATION OF MOLTEN COPPER, W. A. Baker, Res. Mgr., British Non-Ferrous Metals Research Assoc., London.

PHASE CHANGES ASSOCIATED WITH SIGMA FORMATION IN 18-8-3-1 CHROMIUM - NICKEL - MOLYBDENUM - TITANIUM STEEL, K. W. J. Bowen and T. P. Hoar, Dept. of Metallurgy, Univ. of Cambridge, England.

BELGIAN PRACTICE FOR PRODUCING BESSEMER STEEL LOW IN NITROGEN AND PHOSPHORUS, Pierre Coheur, Metallurgy Dept., Univ. of Liege, Belgium.

CRYSTAL ORIENTATION IN COLD-ROLLED SILICON-IRON SHEET, I. Gokyu and H. Abe, University of Tokyo.

AN INTERPRETATION OF THE HYSTERESIS LOOPS IN A_3 AND A_4 TRANSFORMATIONS OF PURE IRON, Kôtarô Honda and Mizuho Satô, Honda Laboratory, Scientific Research Inst., Tokyo.

RAPID ANALYSIS OF HYDROGEN IN MOLTEN STEEL BY VACUUM FUSION METHOD, Yoshio Ishihara and Shigeki Sawa, Japan Special Steel Co., Tokyo.

DEEP-DRAWING LIMITS FOR RECTANGULAR ALUMINUM BOXES, Toshisada Ishikawa, Nippon Aluminum Mfg. Co., Ltd., Osaka, Japan.

THE ALLOTROPY OF COBALT, A. G. Metcalfe, Res. Metallurgist, Deloro Smelting and Refining Co., Ltd., Deloro, Ont., Canada.

STUDY ON AGE-HARDENING, Yoshitsugu Mishima, Faculty of Engineering, Univ. of Tokyo.

MAGNETIC MEASUREMENTS OF AGE-HARDENING OF IRON-MOLYBDENUM ALLOYS, Tokushichi Mishima, Ryukiti R. Hasiguti and Yasuo Kimura, Faculty of Engineering, Univ. of Tokyo.

ELIMINATION OF YIELD POINT PHENOMENA BY TEMPER ROLLING AND ROLLER LEVELLING, N. H. Polakowski, University College, Swansea, Gr. Britain.

THE MECHANICAL PROPERTIES OF IRON AND SOME IRON ALLOYS OF HIGH PURITY, W. P. Rees, National Physical Lab., Teddington, Middlesex, England.

A PROPOSED STEEL MAKING PROCESS, Alessandro Reggiori, Inst. Scientifico Tecnico Ernesto Breda, Sesto, San Giovanni, Italy.

A NEW PROCESS FOR DIRECT REDUCTION OF IRON PYRITES, A. Scortecci and M. Scortecci, Finsider Metallurgical Inst., Genoa, Italy.

OPERATION OF A BURNER-TYPE OPEN HEARTH, Iwao Murata, Chief of Steel Dept., Muroran Works, Fuji Iron and Steel Co., Ltd., Japan.

ANTI-CORROSIVE TREATMENTS FOR MAGNESIUM, Tukasa Kawamura, Asst. Ch. of Mfg., Dept. of Nikko Copper Works, Furakawa Electric Co., Nikko, Japan.

WELDING AUSTENITIC STEELS FOR HIGH-PRESSURE BOILER PLANTS, Egon Kauhausen, Ch. Metallurgist, Welding Laboratory, Bohler Bros. Edelstahlwerk, Dusseldorf, Germany.

SEASON CRACKING OF MANGANESE BRASS PROPELLERS, Yoshio Kaneda, The Hiroshima Shipyard and Engine Wks., West Japan Heavy Industries, Ltd., Hiroshima, Japan.

COCKERILL COMPANY'S EXPERIENCE WITH THE PERRIN PROCESS, J. Janvier, M. Nepper and J. Levaux, John Cockerill S.A., Seraing, Belgium.

A COMPARISON BETWEEN FE-CR-AL AND NI-CR ALLOYS FOR HIGH TEMPERATURE SERVICE, Gosta Hildebrand, Dir. of Research, Kanthal Inc., Hallstahammer, Sweden.

SHORT CYCLE ANNEALING OF WHITEHEART MALLEABLE CASTINGS, P. F. Hancock, Ch. Metallurgist, Birlec Ltd., Birmingham, England.

IMPROVED ALUMINUM-TIN ALLOYS AS POSSIBLE BEARING MATERIALS, H. K. Hardy, E. A. G. Liddiard, Fulmer Research Institute, and J. Y. Higgs and J. W. Cuthbertson, Tin Research Institute, England.

THE INFLUENCE OF DIFFERENT SURFACE COATINGS ON THE FATIGUE STRENGTH OF STEEL, Otto Forsman and Evert Lundin, Government Testing Institute, Stockholm, Sweden

SOME FACTORS AFFECTING THE WEAR OF BRONZE, S. G. Daniel and R. Graham, Thornton Research Center, Shell Refining and Marketing Co., Ltd., Chester, England.

EXPERIMENTAL PRODUCTION OF MAGNETIC (SENDUST) POWDER CORES, E. G. Thurlby, Superintending Metallurgist, Defense Research Labs., Melbourne, Australia.

THE COMMERCIAL DEVELOPMENT OF THREE GERMAN WROUGHT ZINC ALLOYS, Jacob Schramm, Ch. Metallurgist, Casting Shop and Extrusion Shop, Heinrich Diehl, Inc., Stuttgart, Germany.

THE EFFECT OF SMALL ALUMINUM ADDITIONS ON ALLOY STEEL, Mario Signora, Dir. of Research and Control Dept., Acciaierie e Ferriere Lombarde Falck, Milan, Italy.

THE CAUSE OF CHECK MARKS ON COPPER WIRE, B. I. Strom and B. G. Waller, AB Svenska Metallverken, Vasteras, Sweden.

FLAME RADIATION, G. M. Ribaud, Dir. of Study and Research on Gas, and Prof., University of Paris, France; J. E. deGraaf, Head, Labs. and Research, Royal Netherlands Iron and Steel Works, Ijmuiden, Netherlands; O. A. Saunders, Prof. Mechanical Engrg., Imperial College, Univ. of London, England; M. W. Thring, Head, Physics Dept., British Iron and Steel Research Assoc., London, England.

TWO POWDER METALLURGICAL METHODS TO PREPARE ALLOY SPECIMENS ON A LABORATORY SCALE, Jacob Schramm, Ch. Metallurgist, Casting Shop and Extrusion Shop, Heinrich Diehl, Inc., Stuttgart, Germany.

THE USE OF COMBUSTION MODELS IN OPEN-HEARTH FURNACE STUDIES, A. H. Leckie, Head, Steelmaking Div., British Iron and Steel Research Assoc., London, England.

MECHANICAL PROPERTIES OF SPRING STEEL, T. Mitsuhasi, M. Ueno, R. Nakagawa, and K. Tsuya, Govt. Mechanical Lab., Tokyo, Japan.

JAPANESE SUBSTITUTION STEELS IN THE LAST WAR, Seiji Nishikiori, Managing Dir. and Ch. Engr., Shin-Daido Steel Mfg. Co., Ltd.

RECENT DEVELOPMENTS IN THE METALLURGY OF ALUMINUM PISTON ALLOYS WITH HYPEREUTECTIC SILICON CONTENT, Emma Maria Onitsch-Modl, Privatdocent, University of Leoben, Austria.

MINERAL AND METAL INDUSTRIES OF INDIA, Dara P. Antia, British Aluminum Co. Ltd., New Delhi, India.

SMELTING KUJI IRON SAND BY THE KRUPP-RENN PROCESS, Kenji Kuwada, Exec. Dir. and Gen. Mgr., Fukiai Plant, Kawasaki Steel Corp., Kobe, Japan.

THE PLASTIC DEFORMATION OF ZINC BICRYSTALS, Tomoyoshi Kawada, Govt. Mechanical Lab., Ministry of International Trade and Industry, Tokyo, Japan.

A STATISTICAL ANALYSIS ON THE FORMATION OF CORNER CRACKS IN STEEL INGOTS, Adolfo Antonioli, Head, Control Dept., Societa Italiana Ernesto Breda, Milan, Italy.

EFFECT OF HYDROGEN ON THE DEFORMATION AND FRACTURE OF IRON AND STEEL IN SIMPLE TENSION, Paul Bastien and Pierre Azou, Ecole Centrale des Arts-et-Manufactures, Paris, France.

REDUCIBILITY OF ZINCIFEROUS ORES, E. Frenay, Prof. of Nonferrous Metallurgy, University of Liege, Belgium.

THE CONTINUOUS THERMAL TREATMENTS OF ALUMINUM ALLOY STRIP, Marcel Lamourdedieu, Dir., Central Light Alloys Corp., Issoire, France.

BRIGHT CHROMIZING BY THE FRENCH ONERA PROCESS, Bernard Jousset, Pres. and Dir. Gen., Societe Parisienne de Cementation, Paris, France.

WELDING TOOL STEELS, Tore Noren, Elektriska Svetningsaktiebolaget, Goteborg, Sweden.

DEEP WELDING—A NEW METHOD OF OXYACETYLENE WELDING, R. Gunnert, Head, Welding Research Lab., Svenska Aktiebolaget Gasaccumulator (AGA), Stockholm, Sweden.

METALLOGRAPHIC TECHNIQUES AND APPLICATIONS OF THE ELECTROLYTIC POLISHING OF ZIRCONIUM, TITANIUM AND BERYLLIUM, P. A. Jacquet, Cons. Engr. for the Construction and Naval Arms, Paris, France.

DEEP DRAWING SHEET STEEL, E. M. H. Lips, Ch. Engr., N. V. Philips' Glowlampworks, Eindhoven, Holland, and F. J. H. Rolink, Metall. Engr., Van Doorne's Aanhangwagenfabrick N. V., Eindhoven, Holland.

BASIC ELECTRIC ARC STEEL VERSUS ACID OPEN HEARTH STEEL FOR ROLLER BEARINGS, Bengt Kjerrman, Aktiebolaget Svenska Kullagerfabriken (SKF), Goteborg, Sweden.

METALLURGICAL EDUCATION, RESEARCH AND DEVELOPMENT WORK IN NORWAY, A. B. Winterbottom, Dept. of Metallurgy, Norway's Inst. of Technology, Trondheim, Norway.

MODERNIZATION OF AN OLD DRAW-BENCH FOR COLD DRAWN BARS, Nils L. Gripenberg, Mgr., Heat Treatment and Finishing Dept., Imatra Steelworks, Imatra, Finland.

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CHAPTER MEETING CALENDAR

CHAPTER	DATE	PLACE	SPEAKER	SUBJECT
Baltimore	**Feb. 18**	Engineers Club	**W. F. Hipple**	Induction Heating and Melting
Birmingham	**Feb. 6**	Hoopers Cafe	**J. R. Vilella**	Metallographic Techniques for Steel
Boston	**Feb. 1**	Hotel Shelton	**A. D. Bach**	Practical Heat Treatment
Buffalo	**Feb. 14**	Hotel Sheraton	**L. F. Epstein**	Materials for Nuclear Reactors
Calumet	**Feb. 12**	Phil Smidt & Son Whiting, Ind.	**R. L. Wilson**	Spectroscopy of Iron and Steel
Canton-Massillon	**Feb. 5**	Mergus Restaurant		Non-Technical Meeting
Chicago	**Feb. 11**	Furniture Mart	**V. T. Malcolm**	Selection of Alloy Steels for Elevated-Temperature Service
Cincinnati	**Feb. 14**	Engineering Society	**Porter R. Wray**	Boron-Treated Steels
Cleveland	**Feb. 4**	Hollenden Hotel	**J. F. Victory**	Some Problems of Very High-Speed Flight
Columbus	**Feb. 6**	Broad St. Church of Christ	**Porter R. Wray**	Boron Steels
Dayton	**Feb. 13**	Engineers Club	**C. H. Sample**	Corrosion Behavior and the Protective Value of Electrodeposited Metallic Coatings
Des Moines	**Feb. 12**		**F. W. Waterman**	Crystals and Stones
Detroit	**Feb. 11**	Rackham Bldg.	**John Chipman**	National Officers' Night
Eastern N. Y.	**Feb. 12**	Circle Inn, Lathams, N. Y.		Students' Night
Fort Wayne	**Feb. 11**	Howard Johnson's	**Ralph L. Wilson**	High-Temperature Steels
Hartford	**Feb. 12**	The Hedges, New Britain, Conn.	**O. E. Cullen**	Gas Carburizing and Carbon Control
Indianapolis	**Feb. 18**	McClarney's Rest	**J. B. Johnson**	Low Density Metals (Mg, Al, Ti)
Lehigh Valley	**Feb. 1**	Hotel Traylor, Allentown, Pa.	**E. E. Thum**	Implications of Atomic Energy
Los Angeles	**Feb. 28**	Rodger Young Audit.	**E. R. Johnson**	Alternate Steels
Louisville	**Feb. 5**	Kapfhammer's Party House	**Gen. F. R. Dent**	(Stoughton Night) Recent Aircraft Development
Mahoning Valley	**Feb. 12**			Ladies' Night Valentine Party
Milwaukee	**Feb. 19**	Hotel Wisconsin	**L. P. Tarasov**	Some Metallurgical Aspects of Grinding
Missouri School of Mines	**Feb. 13**			
Montreal	**Feb. 4**	Spanish Room, Queens Hotel	**H. P. Croft**	New Developments in Titanium
Muncie	**Feb. 12**		**R. C. Gibson**	Corrosion Prevention
New Haven	**Feb. 21**	Colonial House, Hamden	**E. S. Rowland**	Making the Most of Engineering Alloy Steels
New Jersey	**Feb. 18**	Essex House, Newark	**W. E. Day**	Substitute Steels and Their Heat Treatment
New York	**Feb. 11**	Schwartz Restaurant	**George Skurla**	Dynamic Testing of Aircraft in Flight
North Texas	**Feb. 17**	Dallas	**Carl Betz**	Nondestructive Testing
North West	**Feb. 21**	Covered Wagon		
Northern Ontario	**Feb. 20**	Windsor Hotel, Sault Ste. Marie	**R. Hordegen**	Drop Forging Practice
Northwestern Pa.	**Feb. 28**	Meadville Pa.	**Geo. A. Roberts**	Vanadium in Toolsteel
Notre Dame	**Feb. 13**		**C. L. Clark**	Alloys for High-Temperature Use
Oak Ridge	**Feb. 20**	K of C Hall, Jefferson Circle	**F. G. Tatnall**	Dynamic Testing
Ontario	**Feb. 1**	Royal Connaught Hotel, Hamilton	**H. Thomasson**	Application of Metallurgical Principles to Product Design
Oregon	**Feb. 22**			Movie Night
Ottawa Valley	**Feb. 5**	P.M.R. Labs.	**F. L. LaQue**	Corrosion Testing
Penn State	**Feb. 12**	Mineral Industries Art Gallery	**Eugene Paliwoda**	Machinability
Philadelphia	**Feb. 29**	Engineers Club	**R. H. DeMott**	A President Views the Metal Industry
Pittsburgh	**Feb. 14**	Roosevelt Hotel	**G. A. Roberts**	Toolsteels, Their Applications and Heat Treatment
Purdue	**Feb. 19**	Purdue Union	**R. F. Miller**	Fifty Years of Metallurgy
Rhode Island	**Feb. 6**		**E. H. Trussell**	Protective Coatings
Rochester	**Feb. 11**	Chamber of Commerce	**G. S. Sullivan**	
Rocky Mountain				
Pueblo	**Feb. 14**		**J. R. Miller**	The Electron Microscope
Denver	**Feb. 15**			
St. Louis	**Feb. 15**		**A. P. Gagnebin**	Recent Developments in the Field of Ferrous Castings Metallurgy
Southern Tier	**Feb. 11**	Vestal American Legion	**Edsel Bishop**	Spark Testing
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Tri-City	**Feb. 5**		**Austin Heller**	The Metallurgical Aspects of Welding
Tulsa	**Feb. 11**		**M. J. Day**	Heat Treating Steels to Obtain Maximum Toughness
Utah	**Feb. 28**	Salt Lake City	**H. S. Avery**	Abrasion and Wear
Washington	**Feb. 11**		**H. J. French**	Alloying Elements for Steel (Burgess Memorial Lecture)
West Michigan	**Feb. 18**		**W. H. Smith**	Practical Applications of Quality Control Methods
Worcester	**Feb. 13**	Hickory House		Visit to Harrington & Richardson Arms Co.
York	**Feb. 13**	York, Pa.	**Richard K. Lee**	Fundamentals of Welding Metallurgy

A. S. M. Review of Current Metal Literature

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Prepared in the Library of Battelle Memorial Institute, Columbus, Ohio
W. W. Howell, Technical Abstractor

A GENERAL METALLURGICAL

1-A. Well Heeled. *Business Week,* Nov. 17, 1951, p. 82, 84.

Activities and financial status of American Society for Metals. Outlines publications, Metal Show activities, income and expense breakdown, and a new awards program for teachers of metallurgy. (A9)

2-A. Lead Supply Fading Away. *Business Week,* Nov. 17, 1951, p. 124, 126, 129.

The lead supply problem and the various factors affecting it. (A4, Pb)

3-A. Waste Treatment in the Modern Steel Mill. J. E. Cooper, *Iron and Steel Engineer,* v. 28, Nov. 1951, p. 81-84.

Various functions to be performed in the steel mill. (A8)

4-A. Alan Wood Steel Installs Mill Scale Recovery Plant. R. F. Coltart. *Iron and Steel Engineer,* v. 28, Nov. 1951, p. 128.

A waste-treatment plant that features a mill scale recovery technique. (A8)

5-A. Research Into the Properties of Tin. *Machinery Lloyd,* (Overseas Edition), v. 23, Oct. 27, 1951, p. 91, 93-94.

Work at Tin Research Institute in England. (A9, Sn)

6-A. Some Industrial Treatment Plants in Connecticut. Willis J. Snow. *Sewage and Industrial Wastes,* v. 23, Nov. 1951, p. 1408-1418.

A review of several of the more successful industrial waste treatment plants in Connecticut. Includes pickle liquor from steel-wire mills, plating-room wastes, metal wastes containing cyanide, and paperboard-mill white water. (A8)

7-A. Design and Operation of a Metal Wastes Treatment Plant. C. M. Gard, C. A. Snavely, and D. J. Lemon. *Sewage and Industrial Wastes,* v. 23, Nov. 1951, p. 1429-1438.

Design and construction of plant of Ranco, Inc., Delaware, Ohio. Cleaning and plating operations involved include oil and dirt removal from stampings by washing with an alkaline cleaner, cleaning and acid dips in preparation for plating, zinc and copper plating, and Iridite treatment (chromating) of certain parts. (A8, L12, L14)

8-A. The Basic Metal. Paul Cohen. *Technology Review,* v. 54, Nov. 1951, p. 25-28, 42, 44.

Trends in the steel industry. Outlook for future output. Some production data. (A4, ST)

9-A. Catalytic Combustion of Atmospheric Contaminants in Effluent From Wire Enameling Ovens. Alexander E. Goss. *Wire and Wire Products,* v. 26, Nov. 1951, p. 1051-1055, 1089-1090.

Investigation indicates that considerable reduction of atmospheric contaminants and combustible materials is possible. (A8, L26)

10-A. Conservation of Strategic Metals in Germany. Karl P. Harten. *Metal Progress,* v. 60, Nov. 1951, p. 58-63.

Cooperation of consumers; search for dependable short-time tests; conservation in processing and designing; conservation in steel production and in nonferrous metals; substitution of alloys; desirability of cooperation and research. (A general)

11-A. A Sampling From World Metallurgical Congress Visitations. *Metal Progress,* v. 60, Nov. 1951, p. 77-87.

A summary of reports. Inspections and control in process; manufacture of special bronze; welding of auto bodies and soldering of radiators; pyrometers, furnaces and controls; wrought and cast magnesium; machinability in relation to chips; and lubricants and thin-walled bearings. (A5)

12-A. Manganese: New Supply in Steel Slag. T. Metaxas. *Iron Age,* v. 168, Dec. 6, 1951, p. 111-112.

Four methods are being worked out for the recovery of Mn. The process reported to be nearest commercial application is that of the Bureau of Mines station in Pittsburgh. A miniature blast furnace is producing from slag, a high-phosphorus spiegeleisen for conversion to a product similar to commercial grade Mn. (A8, B21, Mn)

The coding symbols at the end of the abstracts refer to the ASM-SLA Metallurgical Literature Classification. For details write to the American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio.

13-A. Toxic Metals Cause New Industrial Disease Problems. W. Schweisheimer. *Iron Age,* v. 168, Dec. 6, 1951, p. 159-161.

Examples of the kinds of disease problems caused by specific metals. 18 ref. (A7)

14-A. The Growth of Western Steel. Walther Mathesius. *Western Machinery and Steel World,* v. 42, Nov. 1951, p. 90-93, 108.

An address before Los Angeles Chapter A.S.M. History of western steel industry. (A4, A2, ST)

15-A. Aluminum: New Kaiser Plant Opens. *Iron Age,* v. 168, Dec. 13, 1951, p. 88-89.

Kaiser Aluminum & Chemical Corp.'s Chalmette plant at New Orleans, La. Fuel requirements and materials are discusssed. (A5, Al)

16-A. Production of Copper Sulphate From Mine-Water Precipitate. A. G. Lyle. *Canadian Mining and Metallurgical Bulletin,* v. 44, Nov. 1951, p. 715-716; *Transactions of the Canadian Institute of Mining and Metallurgy,* v. 54, 1951, p. 445-446.

Plant and procedure by which $CuSO_4$ is now being made, and by means of which an appreciable saving is being effected. The $CuSO_4$ is used in the mill for recovery of sphalerite by flotation. (A8, B14, Cu)

17-A. Conservation of Materials. J. R. Widdowson. *Iron and Steel,* v. 24, Nov. 1951, p. 497-499.

The scarcity of alloy steel, stainless steel and toolsteel as well as H_2SO_4 for pickling, and of fuels. Suggestions on conservation practices. (A4, AY, SS, TS)

18-A (Book) **Industrial Wastes; Their Conservation and Utilization. Ed. 1.** Charles H. Lipsett. 317 pages. 1951. Atlas Publishing Co., 425 West 25th St., New York 1, N. Y.

Purpose of the book is to give the average reader an acquaintance with the principal scrap and waste materials, their sources of supply, their production and processing. The various types of wastes are discussed in turn. Includes several sections on metallic wastes. (A8)

19-A. (Book) **Punched Cards; Their Applications to Science and Industry.** Robert S. Casey and James W. Perry, editors. 506 pages. 1951, Reinhold Publishing Corp. 330 W. 42nd St., New York 18, N. Y. $10.00.

Introduction by the editors; three

articles on punched-card applications; ten articles on miscellaneous considerations, including mathematical calculations involved in design of punched-card systems; an article on the possibility of applying mechanized methods to scientific and technical literature; and a bibliography of 276 references. Primary purpose is to meet the needs of the individual scientist or engineer. Hand-sorted edge-punched cards are discussed in greater detail than machine-sorted cards. (A3, U8)

20-A. (Book) **Alcoa, an American Enterprise.** Charles C. Carr. 292 pages. Rinehart & Co., Inc., New York City. $3.50.

A highly readable and restrained account of the American aluminum industry by a man who was director of public relations for Alcoa for some 15 years. As befits a volume for the general reader, much is said about the unusual personalities involved in the growth of the corporation, but the book also is a well-balanced statement of the development of ore resources, power plants, fabrication mills, products, markets, and hasty expansion under wartime conditions. Fascinating chapters describe the almost interminable law suits brought by the U. S. Government under the antitrust act. E.E.T. (A2, A4, A5, A1)

21-A. (Book) **Herbert H. Dow; Pioneer in Creative Chemistry.** Murray Campbell and Harrison Hatton. 168 pages. 1951. Appleton-Century-Crofts, Inc., New York City.

One of the best of several recent "popular" books about personages important to American industrial progress in the first half of the 1950's, and published by or for the firms which remain as their monuments. Henry Ford and Herbert H. Dow were kindred spirits in that each had creative minds and sufficient drive to convert new ideas into commercial operations. Each started on a shoestring and each was responsible for a near-revolution in American life—respectively, the Model T and aspirin. In all seriousness, metallurgists will enjoy this book about a great American. His conquest of magnesium chloride was only one of his major accomplishments. E.E.T. (A2, Mg)

22-A. (Book) **Annual Report of Council.** 131 pages. 1950. British Iron & Steel Research Assn., 11 Park Lane, London W. 1, England.

Includes summary of work of the various divisions in metallurgy and metalworking. (A9)

23-A. (Book) **The Wire Industry Encyclopaedic Handbook.** 400 pages. 1951. Wire Industry, Ltd., 33 Furnival St., London, England.

Useful directory and dictionary of nearly all the products covered by the English wire industry includes an alphabetical directory of the names and addresses of all the firms mentioned in the handbook. A section deals with wire-mill supplies followed by a survey of machinery, wire supplies and wire parts, springs and services. Diamond and sintered carbide dies, and notes on the maintenance of drawing dies as well as on the inspection and maintenance of diamond wire drawing dies. (A10, F28)

B

RAW MATERIALS AND ORE PREPARATION

1-B. Arches of High Rise Designed for Stability. J. D. Keller and J. Spotts McDowell. *Blast Furnace and Steel Plant,* v. 39, Nov. 1951, p. 1358-1370, 1399.

Design details for refractory roofs of industrial furnaces. Includes graphs and tabular data on thermal properties of various types of refractory brick. (B19)

2-B. Heavy-Media Separation of Northern Alabama Iron Ores. J. B. Baker. *Mining Congress Journal,* v. 37, Nov. 1951, p. 45-48.

Commercial development. (B14, Fe)

3-B. Incorporating Scrap in Ore Smelting Processes. C. C. Downie. *Mining Journal,* v. 237, Oct. 5, 1951, p. 338-339.

Methods adopted by large refineries with regard to the incorporation of nonferrous waste materials in the regular ore charges. (B22, A8)

4-B. New Shaft and Concentrator at International Nickel. *Mining Magazine,* v. 85, Oct. 1951, p. 210-211.

Procedure by which the ore is carried from the mine through crushing and grinding operations. (B12, B13, Ni)

5-B. Nickel Slags. C. C. Downie. *Mining Magazine,* v. 85, Oct. 1951, p. 212-214.

Properties, treatment, and utilization. (B21, Ni)

6-B. International Nickel Co.'s New Creighton Mill and 13th Shaft Now in Operation. *Mining World,* v. 13, Nov. 1951, p. 38-39.

Features of new shaft and a new concentrator. (B14, Ni)

7-B. "Sweat, Ingenuity, Dollars"—A New Mine for Howe Sound. *Mining World,* v. 13, Nov. 1951, p. 40-43.

How the Calera Mining Co. has carved a cobalt and copper producer from Idaho's Salmon National Forest. Procedures in recovery of the metals. (B12, Co, Cu)

8-B. New Rotary Unit Cools Sinter Economically. F. R. Greyson. *Steel,* v. 129, Nov. 19, 1951, p. 98, 101.

Novel method, which cools by ordinary atmospheric conditions without the aid of water or blowers, eliminates disintegration and breakage of the sintered iron ore used in blast furnaces. (B16, Fe)

9-B. Sylvester Process Extracts Manganese From Slag. George R. Sylvester. *Steel,* v. 129, Nov. 26, 1951, p. 84-85.

Includes flowsheet of concentration process. (B14, A8, Mn)

10-B. Ore: Humboldt Process Step by Step. W. G. Patton. *Iron Age,* v. 168, Dec. 6, 1951, p. 115.

A process for the beneficiation of a low-grade, non-magnetic iron-bearing ore, of the specular hematitic variety. (B14, Fe)

11-B. Sintering and Nodulizing Plant of Oliver Iron at Virginia, Minn. *Skillings Mining Review,* v. 40, Dec. 8, 1951, p. 1.

Processes and plant operation. (B16, Fe)

12-B. Greenside Mine; Mining and Milling Practice. (Concluded.) C. Connor. *Mine & Quarry Engineering,* v. 17, Dec. 1951, p. 387-390.

Grinding and flotation practices in the recovery of Pb at the Greenside Mine. Flow sheet. (B13, B14, Pb)

13-B. Triumph Mill—Full Production. *Mining World,* v. 13, Dec. 1951, p. 22-26.

Practices carried on at the Triumph Mining Co. at Triumph, Idaho, in the recovery of Au, Ag, Pb and Zn. Crushing and flotation operations. (B13, B14, Au, Ag, Pb, Zn)

14-B. Ashio Recovers Copper by HMS. *Mining World,* v. 13, Dec. 1951, p. 27-28.

A heavy-media-separation plant in Japan. Operations in the recovery of Cu. (B14, Cu)

15-B. Basic Laboratory Studies in the Unit Operation of Crushing. J. W. Axelson, J. T. Adams, Jr., J. F. Johnson, J. N. S. Kwong, and E. L. Piret. *Mining Engineering,* v. 3, Dec. 1951, *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 190, 1951, p. 1061-1069.

Basic investigations of crushing were concerned mainly with three phases of the problem: mechanism of the fracture process itself, particle-size distribution of the crushed product, and relationship between energy input and amount of new surface produced. 55 ref. (B13)

16-B. Five Variable Flotation Tests Using Factorial Design. Adrian C. Dorenfeld. *Mining Engineering,* v. 3, Dec. 1951, *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 190, 1951, p. 1073-1080.

Factorial design is a mathematical method of drawing valid conclusions from a series of tests made in a predetermined pattern. It is applied to flotation ore testing using, in this case, five variables, each varied twice, requiring a total of 32 tests. Representative conclusions were checked by repeat testing. 19 ref. (B14)

17-B. Katanga's Mineral Empire Based on Many Metals. Edgar B. Sengier. *Engineering and Mining Journal,* v. 152, Nov. 1951, p. 86-89; Dec. 1951, p. 92-96.

Central African enterprise which yields Cu, Zn, Co, Cd, Au, and Ag. Operations comprise open-pit and underground mining, concentration, smelting, and electrowinning. November installment: The deposits and mining procedures, and production and labor-productivity data. December: Facilities for gravity concentration and flotation, smelting, leaching and electrolytic work. (B10, B12, B14, Cu, Zn, Co, Cd, Au, Ag)

18-B. Heavy-Media Separation Recovers Limestone From Zinc. Walter B. Lenhart. *Rock Products,* v. 54, Nov. 1951, p. 64-71.

Process called HMS consists of placing minus-2-in. rock in a heavy fluid mixture, the density of which is easily and closely controlled. In this fluid, the lighter rocks float and the heavier ones sink thereby affecting a separation. Application of the process to Zn recovery. Flowsheets. (B14, Zn)

19-B. Recovery of Vanadium From Titaniferous Magnetite. Sandford S. Cole and John S. Breitenstein. *Journal of Metals,* v. 3, Dec. 1951, *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 191, 1951, p. 1133-1137.

Recovery of over 80% of the vanadium values in titaniferous magnetite from MacIntyre Development, Tahawus, N. Y., was accomplished by an oxidizing roast with Na_2CO_3-NaCl addition. Process for leaching of roasted ore and precipitation of V_2O_5 and Cr_2O_3 from leach liquor. 20 ref. (B14, B15, V)

20-B. Low Grade Bauxites and Clays as Potential Aluminum Resources. K. K. Kershner, C. W. Funk, and W. A. Calhoun. *Journal of Metals,* v. 3, Dec. 1951, *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 191, 1951, p. 1138-1142.

Future resources of aluminum may require the utilization of low-grade ores. Aluminum minerals such as clay, shale, and high-iron laterites may become important sources. An evaluation of reserves. New laboratory results on the Vereinigte desilication process. 22 ref. (B10, Al)

21-B. Experiences With Chromite Hearths in Electric Furnaces. Alexander L. Field. *Journal of Metals,* v. 3, Dec. 1951, p. 1123-1125.

Reviews work from 1912 to date. (B19)

22-B. The Production of High Temperatures in Industry by Town Gas. R. F. Hayman. *Gas World,* v. 134, Dec. 1, 1951, p. 495-504.

Problems associated with furnace design and use of modern refractory materials. Studies of flow patterns have shown that attention to the design of combustion chambers could do much to improve the performance of combustion chambers and improve the performance of existing plants. (B18)

23-B. Exploration and Development of Canadian Uranium Deposits. B. S. W. Buffam, and E. B. Gillanders. *Mining Journal,* v. 237, Nov. 16, 1951, p. 492-495.

Detailed Geiger surveys, diamond drilling, underground development, sampling and metallurgical tests, and operating costs. (B10, B11, B12, U)

24-B. Crystallization of Aluminum Chloride in the Hydrochloric Acid Process for Production of Alumina From Clay. Lewis Jesse Clark, Willard D. Hubbard, and James I. Hoffman. *Journal of Research of the National Bureau of Standards,* v. 47, Oct. 1951, p. 269-271.

When roasted clay is treated with dilute HCl, a solution is obtained that contains Al and other soluble constituents of the clay in the form of chlorides. Crystallization as the hydrated chloride, $AlCl_3 \cdot 6H_2O$, serves to separate the Al from the other soluble chlorides. A process is described for this crystallization on a large scale. (B14, Al)

25-B. Production of Iron Sinter at Helen Mine. K. O. Cockburn. *Canadian Mining and Metallurgical Bulletin,* v. 44, Nov. 1951, p. 745-753, disc., p. 753-754; *Transactions of the Canadian Institute of Mining and Metallurgy,* v. 54, 1951, p. 475-483; disc., p. 483-484.

Part I: Equipment and practice. Part II: Principles and theory of sintering practice as borne out by experience at the Helen plant. (B16, Fe)

26-B. Iron Ore; World Demand and Resources. T. P. Colclough. *Iron and Steel,* v. 24, Nov. 1951, p. 507-508. (A condensation).

A survey. Production data are tabulated. (B10, A4, Fe)

27-B. World Metal Shortages and Resources. *Metal Treatment and Drop Forging,* v. 18, Nov. 1951, p. 515-519; Disc., p. 519.

A summary of several papers sponsored by the Institute of Metals on Oct. 17 in London. Topics include nonferrous metals, substitute alloys, secondary light metals and secondary heavy metals. (B10, A4)

28-B. Diamond Recovery From Grinding Wheel Sludge. R. G. Weavind and R. S. Young. *Metal Industry,* v. 79, Nov. 23, 1951, p. 440.

Recovery is carried out by treatment with aqua regia and fusion with potassium hydroxide, followed by skin flotation of the diamonds in an acid bichromate solution. The procedure is simple, and both the reagents and equipment are inexpensive. (B13, A8)

29-B. The First Gold From the Free State Field. A Description of the St. Helena Reduction Plant. *South African Mining and Engineering Journal,* v. 62, Pt. 2, Oct. 27, 1951, p. 341, 343, 345, 347, 349, 351, 353.

Features of the plant. (B14, Au)

30-B. Large "Arbed" Primary Crushers. (In French.) *L'Ossature Métallique,* v. 16, Nov. 1951, p. 516-522.

Development, construction, and operation of Arbed jaw and rotary crushers. (B13)

31-B. New Developments in the Band-Sintering Process. (In German.) Helmut Wendeborn. *Stahl und Eisen,* v. 71, Nov. 8, 1951, p. 1212-1218.

Equipment and procedures for sintering of fine iron ores. A round sintering machine which sinters in two layers. Output is increased by lime addition. Oxidation phenomena. 17 ref. (B16, Fe)

32-B. Sintering of Iron Ores. (In Polish.) **Part I. Theoretical Basis of the Sintering Process.** W. Madej and B. Sewerynski. **Part II. Effect of Increased Vacuum on the Sintering Process.** S. Holewinski, W. Madej, and B. Sewerynski. *Prace Glownego Instytutu Metalurgii,* v. 3, no. 5, 1951, p. 351-374.

Part I: Important factors such as grain size, agglomeration and compactibility were investigated. The problem of porosity and strength of sinters. A method of calculating sintering efficiency. Part II: The effect of vacuum on sintering time of different ores, as well as effects of various additions. Vacuum of about 1200 mm. H_2O was found best in most cases. (B16, Fe)

33-B. Concerning Certain Micaceous Magnesium-Iron Ores. (In Russian.) D. P. Serdirchenko. *Zapiski Vsesoyuznogo Mineralogicheskogo Obshchestva,* ser. 2, v. 80, no. 3, 1951, p. 175-181.

Micaceous ores of the North Caucasus and Eastern Timan were investigated for contents and modes of occurrence of Fe, Mg, Li, Al, Si, K, etc. 21 ref. (B10, Fe, Mg, Li, Al)

34-B. (Book) **The Formation of Mineral Deposits.** Alan M. Bateman. 371 pages. 1951. John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. $5.50.

Materials involved, theories concerning origin of deposits, relation to igneous activity, primary mineralizing solutions, formation processes, exploration and exploitation of deposits, distribution and conservation of resources, and future outlook. (B10)

35-B. (Book) **Lazarus Ercker's Treatise on Ores and Assaying.** Translated from the German edition of 1580 by Anneliese Grundhaldt Sisco and Cyril Stanley Smith. 360 pages. 41 wood cuts. 1951. University of Chicago Press, Chicago 37, Ill. $10.

Ercker's 1574 book, with early translations into English and Dutch, was the standard book on fire assaying of gold, silver, lead and copper for at least 200 years. (Much of the book is also devoted to the smelting operations, controlled by the assayer's determinations.) Written at a time when alchemical balderdash was in high repute, Ercker's book is precise, factual, accurate, and thoroughly understandable to metallurgists of 1950. Many of his methods are in use today; in fact they are so accurate that the old-time assayers (and smeltermen) believed in the conservation of matter long, long before the idea was formulated as a law by scientists. The translation is most readable and the commentary felicitous. Not only are Mrs. Sisco and Dr. Smith to be complimented, but also the University of Chicago Press for an extremely satisfying volume. E.E.T. (B15, S11)

36-B. (Book) **Basic Refractories.** J. R. Rait. 408 pages. Interscience Publishers, Inc., 250 Fifth Ave., New York 1, N. Y. $10.00.

Raw materials used in the production of basic refractories. The processing and components of basic refractories, followed by a review of available phase-equilibrium data. The performance of basic refractories in open-hearth furnaces, Heroult basic electric furnaces, mixer furnace linings, etc. Bibliography, author and subject index. (B19, D general)

37-B. (Book) **Wärmetechnische Rechnungen für Industrieöfen (Thermal Calculations for Industrial Furnaces).** Ed. 3. Werner Heiligenstaedt, 488 pages. Verlag Stahleisen, Düsseldorf. 44 O.M. (about $10).

Emphasizes fuel economy and how to attain it. Electrically heated furnaces are not included. The calculations are almost entirely restricted to fuels available in Germany. Nature of heat, calorific value of fuels, combustion, heat content of products of combustion, efficiency of heat utilization, fuel saving by preheating. Detailed steps in the production of steel, cast iron, malleable iron, alumina, copper, nickel, aluminum, magnesium, bricks, earthenware, glass, cement, and various chemical substances. Heat calculations and special problems. Heating capacity and fuel economy of batch-type, continuous, openhearth and reverberatory furnaces; furnaces for heating aluminum or magnesium, pit furnaces, shaft furnaces, blast furnaces, etc. Includes the Krupp process for making sponge iron. Bibliography almost entirely limited to German authors and investigators. The technical contents of the book deserve admiration and praise, but some fault must be found with the method of presentation—particularly large use of symbols without explanation.—W. Trinks. (B18, C general, D general)

C

NONFERROUS EXTRACTION AND REFINING

1-C. Cyanidation of Gold-Silver Ore From Manhattan, Nev. A. L. Engel. *U. S. Bureau of Mines,* Report of Investigations 4819, Oct. 1951, 6 pages.

Tests were made to investigate a proposed treatment method for gold and silver ore from the Keystone mine, Manhattan, Nye County, Nev. The ore was crushed to 10 mesh and separated into + and −65 mesh portions. The −65 portion is cyanided by leaching. Laboratory tests indicated that 89% of the Au and 49% of the Ag could be extracted. (C24, Au, Ag)

2-C. Semi-Pilot-Plant Investigations on Electrowinning Manganese From Chloride Electrolytes. J. H. Jacobs, P. E. Churchward, T. E. Hill, Jr., W. H. Curry, E. C. Perkins, and O. Q. Leone. *Mining Journal,* v. 237, Nov. 23, 1951, p. 523-524; Nov. 30, 1951, p. 552-554 (Excerpts from *U. S. Bureau of Mines,* Report of Investigation 4817.)

Previously abstracted from original. See item 122-C, 1951. (C23, Mn)

3-C. Wanted: Cheaper Titanium. *Chemical Week,* v. 69, Dec. 8, 1951, p. 27-28, 31.

The need for a cheap process of producing Ti. Various methods now in the development stage. (C general, Ti)

4-C. Effect of Pressure on the Refining of Lithium by Distillation. R. R. Rogers and G. E. Viens. *Journal of the Electrochemical Society,* v. 98, Dec. 1951, p. 483-487.

The effect of distilling crude Li in the presence of the chemically inert gas argon and the chemically active gases, O_2, N_2, and H_2, at different pressures was investigated. (C22, Li)

5-C. Preparation and Some Properties of Hafnium Metal. Felix B. Litton. *Journal of the Electrochemical Society,* v. 98, Dec. 1951, p. 488-494.

The Hf was separated from Zr by a fractional distillational procedure. Miscellaneous properties are tabulated. 18 ref. (C22, Q general, Hf)

6-C. Dollar-a-Pound Titanium? *Chemical Engineering,* v. 58, Nov. 1951, p. 278.

Production costs can go to this and even lower, say Japanese owners, if they can operate their new process on a large enough scale. Four basic operations make up the process: reduction of iron sand in an electric furnace, producing charcoal pig iron and Ti bearing slag; chlorination of the slag, producing $TiCl_4$; purification of $TiCl_4$; and reduction of $TiCl_4$ with Mg and vacuum distillation to produce metallic Ti. Includes flow diagram. (C4, C26, C27, Ti)

7-C. The Physical Nature of Solid Condensates Produced in the Distillation of Volatile Metals. I. I. Betcherman and L. M. Pidgeon. *Canadian Mining and Metallurgical Bulletin,* v. 44, Nov. 1951, p. 730-735; *Transactions of the Canadian Institute of Mining and Metallurgy,* v. 54, 1951, p. 460-465.

Investigation was confined to the sublimation and distillation of Mg and Ca but results are applicable to cases where the metal is liberated in the gaseous state by reduction of a suitable ore. 12 ref. (C22)

8-C. Electrothermic Treatment of Nickeliferous Ores of Lokrys (Greece). (In French.) Corrado Ferrente. *Journal du Four Electrique et des Industries Electrochimiques,* v. 60, Sept.-Oct. 1951, p. 115-117.

Production of cast nickel and ferronickel. Composition and characteristics during processing. (C21, Ni, Fe-n)

9-C. Aluminothermic Production of Aluminum-Titanium Alloys. (In French.) Jean Cueilleron and Claude Pasgaud. *Comptes Rendus hedbomadaires des Séances de l'Académie des Sciences,* v. 233, Oct. 1, 1951, p. 745-747.

A series of Al-Ti alloys were prepared by aluminothermic reduction of TiO_2 in the presence of a flux and of a substance capable of furnishing oxygen, or in gaseous oxygen, the latter being brought to the surface of the mixture during the reaction. (C26, Al, Ti)

10-C. The Removal of Aluminium From Red Brass. Part II. (In Swedish.) Ake V. Larsson and Börje Löfgren. *Gjuteriet,* v. 41, Oct. 1951, p. 143-151.

Al can be removed from red-brass melts by refining with fluoride-bearing fluxes. The soundness and mechanical properties of a red-brass alloy treated with such fluxes were investigated. Silicon can be removed by the same methods used for Al refining if the melt is free from Al. Influence of small amounts of Al and Si on soundness and mechanical properties. Tendency of the melt to pick up sulfur, when refining with fluxes containing Na_2So_4 as an oxidizer. (C4, Cu)

D

FERROUS REDUCTION AND REFINING

1-D. Internal Structure of Killed Steel Ingots on the Basis of Relative Rates of Solidification. Edward A. Loria. *Blast Furnace and Steel Plant.* v. 39, Nov. 1951, p. 1333-1337.

Proposals for controlling the internal soundness and segregation of killed steel ingots on the basis of relative rates of solidification. Effects of the four components of heat abstraction during solidification, and possible changes in mold design in terms of accelerating vertical solidification. (D9, N12, CN)

2-D. Practical Consideration of Open Hearth Bottom Construction. Philip A. Gaebe. *Blast Furnace and Steel Plant,* v. 39, Nov. 1951, p. 1338-1347.

Methods of installation, materials used and their costs, and systems employed to record such information for openhearth furnace bottom rebuilds. (D2, ST)

3-D. J & L Pours First Steel From New Melt Shop. *Iron and Steel Engineer,* v. 28, Nov. 1951, p. 122, 124, 125.

Features of new Jones and Laughlin Steel Corp. plant include latest developments in openhearth furnace design and use of refractories; instrumentation for high efficiency in the control of temperatures; heat and efficiency of fuel utilization; mechanized material-handling facilities; provisions for using tar, oil, or gas for fuel; and special facilities for handling scrap. (D2, ST)

4-D. Discussion on the Paper—"The Reduction of Lump Ores", R. Wild and H. L. Saunders. *Journal of the Iron and Steel Institute,* v. 169, Oct. 1951, p. 110-113.

Paper published in v. 165, 1950. See item 193-D, 1950. (D1, Fe)

5-D. Joint Discussion on the Papers —"The Distribution of Temperature in Ingot Moulds and Its Relation to Ingot Structure," I. M. Mackenzie and Andrée Donald; **"Ingot Heat Conservation; Time Studies From Casting to Rolling",** A. V. Brancker, J. Stringer, and L. H. W. Savage; and **"Ingot Heat Conservation; Mould and Ingot Surface Temperature Measurements,"** A. V. Brancker. *Journal of the Iron and Steel Institute,* v. 169, Oct. 1951, p. 113-117.

Papers published in v. 166, 1950, p. 19-28; v. 164, 1950, p. 68-84; and v. 165, 1950, p. 307-313; respectively. See items, 273-D, 22-F, 219-D, 1950. (D9, N12, F21, ST)

6-D. Joint Discussion on the Papers— "The Thermodynamic Background of Iron and Steel Making Processes. II. Deoxidation". F. D. Richardson; and **"Studies in the Deoxidation of Iron; Deoxidation by Aluminium",** H. A. Sloman and E. Ll. Evans. *Journal of the Iron and Steel Institute,* v. 169, Oct. 1951, p. 118-125.

Papers published in v. 166, Oct. 1950, p. 137-146; and v. 165, May, 1950, p. 81-90; respectively. See items 358-P and 166-D, 1950. (D general, P12, ST)

7-D. Discussion on the Paper— "Thermodynamic Aspects of the Movement of Sulphur Between Gas and Slag in the Basic Open-Hearth Process", F. D. Richardson and G. Withers. *Journal of the Iron and Steel Institute,* v. 169, Oct. 1951, p. 125-127.

Paper published in v. 165, 1950. See item 165-D, 1950. (D2, B21, ST)

8-D. Studies in the Deoxidation of Iron; Deoxidation by Manganese. H. A. Sloman and E. El. Evans. *Journal of the Iron and Steel Institute,* v. 169, Oct. 1951, p. 145-152.

Preparation, analysis, and microscopical examination of a series of ingots, made by adding O_2 and Mn to 300-400-g. melts of pure iron. Analyses include estimations of the total O_2 and Mn contents of the ingots, and chemical and X-ray analyses of the nonmetallic inclusions obtained by alcoholic-iodine extraction. Microscopical appearance of the inclusions in polished metal sections. The alcoholic-iodine method is shown to be unsatisfactory for the quantitative extraction of inclusions with a high MnO content. A new calculation of equilibrium conditions for deoxidation by Mn using previously published data. 17 ref. (D general, Fe)

9-D. Melting and Sintering of Metals in Vacuo. E. D. Malcalm. *Journal of Scientific Instruments,* Supplement 1, 1951, p. 63-66.

Advantages and application. The various problems peculiar to the use of a furnace in a vacuum enclosure, and the design of such a furnace suitable for melting 50-100 lb. of steel. (D8, ST)

10-D. Operation and Control of an All-Basic Open Hearth Furnace. F. Mitton. *Refractories Journal,* v. 27, Oct. 1951, p. 410-420.

In addition to being an all-basic construction, furnace is also a single uptake furnace, operated with a charge control system, and with automatic control of fuel. (D2, ST)

11-D. The All-Basic Open Hearth. Part II. R. P. Heuer and M. A. Fay. *Refractories Journal,* v. 27, Oct. 1951, p. 423-428.

A comparison is made with American furnaces. Some performance data. (D2, ST)

12-D. Improved Feeder-Head Tile for Ingot Hot Tops. H. O. Howson. *Metal Progress,* v. 60, Nov. 1951, p. 88-90.

Materials used. Development of recessed tiles and their application to mass production steelmaking. (D9, ST)

13-D. Steel Density Controlled. *Steel,* v. 120, Dec. 10, 1951, p. 123.

Methods for producing finished and semifinished steel products having any desired density and analysis within a wide range. Dry, prepared iron ore, generally finer than 60 mesh, is poured directly into suitable molds, reduced at 2000° F. and held for several hours at this temperature. Resultant article has the composition and structure of normal steel except that it contains a predetermined amount of spherical voids which are not interconnected. (D8, ST)

14-D. What Are Present Limits to Electric Furnace Size? J. L. Bray. *Iron Age,* v. 168, Dec. 13, 1951, p. 127-130.

Barring unforeseen electrical developments, arc furnaces for steel melting will probably be built in sizes smaller than 150-ton units. Furnaces will be better but physical and electrical factors will limit size. When current transmitted is greatly increased, losses become disproportionately great. (D5)

15-D. J & L Dedicates 2 Million Ton Open Hearth Shop. *Journal of Metals,* v. 3, Dec. 1951, p. 1126-1127.

Described and illustrated. (D2, ST)

16-D. Modern Trends in Electric Furnace and Transformer Design. P. J. McCurdy. *Journal of Metals,* v. 3, Dec. 1951, p. 1130-1132.

Confined to electric furnaces and auxiliary equipment for use in steelmaking. (D5, ST)

17-D. A Survey of the Sulphur Problem Through the Various Operations in the Steel Plant. T. E. Brower and B. M. Larsen. *Journal of Metals,* v. 3, Dec. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 191, 1951, p. 1163-1171.

Surveys the steel-plant sulfur-distribution and elimination problem from coal to liquid steel ready for teeming, giving distributions of sulfur over a range of coke sulfur content; some methods of sulfur control in the blast furnace, external desulfurization between blast furnace and openhearth; distribution between fuel, slag, and metal; and methods and limitations of control of sulfur in the openhearth. 12 ref. (D1, D2, ST)

18-D. Flow Patterns in Furnaces. J. H. Chesters. *Coke and Gas,* v. 13, Nov. 1951, p. 391-394, 398. (Based on papers in *Journal of the Iron and Steel Institute,* 1949.)

See abstract from *Chemistry & Industry,* item 225-D, 1951. (D2, ST)

19-D. Using Gases in Metal Production. E. Spire. *Canadian Metals,* v. 14, Nov. 1951, p. 10-12.

New type of ladle in which gases

are introduced through a porous refractory plug. It is used for degassing, desulfurization, and similar treatments. (D9, C5)

20-D. Quality Control in Basic Electric Steel Making Practice. A. F. J. Edgerton. *Australasian Engineer,* Oct. 8, 1951, p. 74-81.

The basic principles of steelmaking and furnace operation. Materials used and effects of alloying elements added to the liquid steel in the light of specification requirements. Deals more specifically with Ni-Cr-Mo steels. (D5, AY)

21-D. Chemistry in Metal Extraction. F. D. Richardson. *Engineering,* v. 172, Nov. 2, 1951, p. 569-572.

Effects of physical chemistry and research on ferrous and nonferrous metal extraction. Current possibilities which may become important. Major emphasis is on ferrous reactions. (D general, C general, Fe, ST)

22-D. Influence of Vacuum Melting on the Properties of 25% Chromium Ferrites. (In French.) J. Hochmann. *Revue de Métallurgie,* v. 48, Oct. 1951, p. 734-758; disc., p. 758.

The action of vacuum remelting made under well-defined conditions on certain properties of 25% chromium ferritic stainless steels. Degasification conditions, charge composition, hydrogen content, and synthetic casting techniques. Influence on properties with respect to friction, shock resistance, and intercrystalline corrosion after treatment at 900-1200° C., and with respect to hardening, brittleness, and intergranular corrosion after heating between 400 and 500° C., was investigated. 39 ref. (D8, Q general, R2, SS)

23-D. Use of Pulverized Lime for the Desulfurization of Molten Pig Iron. (In French.) **I. Tests Made in a 3-Ton Furnace.** B. Kalling, C. Danielsson, and O. Dragge. **II. Industrial Practice.** S. Fornander. *Circulaire d'Informations Techniques,* v. 8, no. 10, 1951, p. 1119-1140. (Translated from *Jernkontorets Annaler.)*

Previously abstracted from original. See item 241-D, 1951. (D1, Fe)

24-D. Metallurgy and Economics of Oxygen Enrichment in the Blast-Furnace Process. (In German.) Rudolf Graef. *Stahl und Eisen,* v. 71, Nov. 8, 1951, p. 1189-1198; disc., p. 1198-1199.

Reviews and correlates the literature. Results of experimental investigation of various aspects such as reduction of nitrogen content of bessemer steel, reduction of phosphorus content and of blowing time; possibility of refining low-phosphorus pig iron, and improvement of converter life. Disadvantages; preliminary slag refinement for recovery of V and Mn. 23 ref. (D1, D3, ST, V, Mn)

25-D. Use of Oxygen in the Basic Openhearth Furnace. (In German.) Kurt Heinrich. *Stahl und Eisen,* v. 71, Nov. 8, 1951, p. 1199-1204.

Enrichment of the combustion air in gas producers to 23.5% O_2 and increase of the calorific content of the gas to 1530 cal. per cu. m. Advantages and disadvantages, including economic factors. (D2, ST)

26-D. Use of Oxygen-Enriched Air in the Openhearth Furnace and in the Gas Producer. (In German.) Wilhelm Baumgardt. *Stahl und Eisen,* v. 71, Nov. 8, 1951, p. 1204-1211; disc., p. 1211-1212.

Reviews the literature; tabular and graphical data. Advantages, particularly for short furnaces, because of reduced flame length. 21 ref. (D2, ST)

27-D. The Stürzelberg Process for Production of Pig Iron. (In German.) H. Reinfeld. *Giesserei,* v. 38, Oct. 4, 1951, p. 517-523.

New process of producing pig iron from iron pyrites. The problem, complicated by the presence of up to 10% Zn and 4-7% S, was solved by application of a short rotary reducing furnace. Advantages and drawbacks. Properties of resulting pig iron. (D8, Fe)

28-D. Theory of Heat Transfer in Openhearth Furnaces and Its Consequences. (In Czech.) Antonin Benda. *Hutnické Listy,* v. 6, Sept. 1951, p. 433-439.

Relationships of heat consumption, thermal efficiency, and heat losses to furnace efficiency. The amount of heat transferred during melting, also effective gas-volume regulation. With the aid of theoretical calculations, general equations for minimum melt time and maximum furnace efficiency are derived. The equation of thermal characteristics is used to deduce the relation of specific consumption of heat to furnace size. (D2, ST)

29-D. Production of Sponge Iron in Metal Containers. (In Portuguese.) Fernando A. de Toledo Piza. *Boletim da Associacao Brasileira de Metais,* v. 7, July 1951, p. 240-246.

Possibility of shortening the production cycle of sponge iron by the Swedish Höganäs process was studied, in order to reduce the size of equipment. (D8, Fe)

30-D. (Book) **The Making, Shaping and Treating of Steel.** Ed. 6, 1951. U. S. Steel Co., Pittsburgh. 1584 pages.

The scope and appearance of this edition is about the same as the 5th edition printed in 1940 under authorship of C. B. Francis, although the text has been either rewritten or drastically edited by "cooperative efforts of numerous authors, editors and reviewers". The wordage is increased 15% and it contains a 150-page index. It is far more than a statement of Steel Corporation practices; it is a systematic statement of the metallurgy of iron and steel mill products as of today. Heat treatment is fully treated, but fabrication problems are not. As an indication of the broadened scope the following new subdivisions in the chapter on bessemer process may be noted: economic considerations; oxygen enriched blast; temperature control. (D general, F general, J general, ST)

E

FOUNDRY

1-E. Heat Transfer Coefficients of Centrifugal Casting. C. L. Register, H. F. Taylor, and B. G. Rightmire. *American Foundryman,* v. 20, Nov. 1951, p. 34-37.

Temperatures in spinning cylindrical molds and tubular castings were determined by means of a series of thermocouples connected to recording potentiometers through specially designed commutators. Heat-transfer coefficient of Cu centrifugally cast in steel molds and of mold to air were calculated. (E14, Cu)

2-E. Air Preheater Unit for Small Cupolas Aids Melt Efficiency. Lloyd G. Berryman. *American Foundryman,* v. 20, Nov. 1951, p. 40-42.

An economical heat exchanger that has materially increased cupola melting efficiency during a 5-year testing period at Texas A & M College. (E10, CI)

3-E. Calculating Riser Dimensions; a Basic Approach to Risering Gears. R. A. Willey. *American Foundryman,* v. 20, Nov. 1951, p. 46-50.

Method of computing riser dimensions worked out on the basis that the freezing rate of a casting or section of casting can be estimated by comparison of the surface areas dissipating heat and the respective volume, or ratio of section surface area to section volume. Freezing rates for risers of various sizes are tabulated on the same basis, and a comparison of casting section and riser freezing rates indicates riser size required for proper feeding. (E22)

4-E. Modern Foundry Methods; Industry-Sponsored Research. R. R. Lubker. *American Foundryman,* v. 20, Nov. 1951, p. 51-53.

Experimental foundry facilities and research programs of Armour Research Foundation, Chicago. (E general, A9)

5-E. Controlling Die-Casting Flash. W. M. Holliday. *American Machinist,* v. 95, Nov. 26, 1951, p. 135-142.

General rules, practical hints, and tricks of the trade. (E13)

6-E. Tiny Engines Are Big Business. Pat Dwyer and Robert H. Herrmann. *Foundry,* v. 79, Dec. 1951, p. 96-97, 269-271.

Small castings produced at Miniature Engine Laboratories, Sandusky, Ohio. Application of the foundry equipment to work of a specialized nature involving complicated partings. Most castings are 85-5-5-5 bronze or aluminum (E11, Cu, Al)

7-E. Observations on Bronze Foundry Practice. Harold J. Roast. *Foundry,* v. 79, Dec. 1951, p. 110-111.

Various methods employed in casting bronze parts. (E11, Cu)

8-E. The Basic-Lined Cupola. J. P. Holt. *Foundry,* v. 79, Dec. 1951, p. 92-95, 264-268.

Recommendations for installation of the lining and operation of the cupola. (E10, CI)

9-E. New Mechanized Cupola Charging System. *Foundry Trade Journal,* v. 91, Nov. 1, 1951, p. 495-498.

At International Harvester Co. of Great Britain, Ltd., Doncaster, England. (E10, CI)

10-E. Thermal Considerations in Foundry Work. V. Paschkis. *Foundry Trade Journal,* v. 91, Nov. 1, 1951, p. 507-513; Nov. 8, 1951, p. 530-534, 536.

Extensive oral and written discussion of the above paper in June 21 and 28 issues. See item 395-E, 1951. (E25)

11-E. Foundries in the French Ardennes. A. R. Parkes. *Foundry Trade Journal,* v. 91, Nov. 8, 1951, p. 525-529.

Includes extensive details of one particular foundry which has an unusual mechanized system for cast-iron production in sand molds. (E11, CI)

12-E. Problem Castings Can Be Turned Into Production Jobs. T. J. McLeer. *Iron Age,* v. 168, Nov. 22, 1951, p. 86-89.

Distortion, shrinkage and feeding difficulties characterize 5 problem castings produced by a stainless steel foundry. A jet-engine support with spindly, multiple arms and a 2-ton, 4-blade propeller were among the jobs that had to meet close tolerances. (E11, SS)

13-E. Jobbing Foundry Adopts C-Process for Making Shell Molds. A. W. Calder, Jr. *Iron Age,* v. 168, Nov. 15, 1951, p. 111-116.

Application of shell-molding or croning process by Builders Iron Foundry, Providence, R. I., for making Meehanite castings. Advantages lie in the quality of the casting produced, the inherent savings in metal and alloys, and the close tolerances to which the castings can be produced. (E18, CI)

14-E. Resin Makers Push Croning Process. D. I. Brown. *Iron Age,* v. 168, Nov. 15, 1951, p. 120-121.

The Croning "C Process" and its development. Low-viscosity phenolic resins are finding wide application in this process. (E18)

15-E. Rugged Vacuum Furnace Built for Semi-Production Use. J. M. Taub and D. T. Doll. *Iron Age*, v. 168, Nov. 15, 1951, p. 125-128.

Practical all-metal vacuum furnace which will melt from 5 to 50 lb. of metal. A minimum of glass or quartz compounds is used. Chief metal used is stainless steel. Eitner resistance or induction heating units can be employed. Maintenance is reduced to a minimum. (E10, T5, SS)

16-E. Experiments on the Reaction of Aluminium-Magnesium Alloys With Steam. A. J. Swain. *Journal of the Inst.tute of Metals*, v. 80, Nov. 1951, p. 125-130.

The reaction of Al-Mg alloys containing up to 25% Mg with pure steam was investigated for temperatures from 450 to 700° C. Maximum reactivity, dependent on composition, was found at temperatures between 550 and 625° C. Significance of these results in relation to metal mold reaction in the Al + 10% Mg alloy. (E25, P13, Al)

17-E. Investment Casting: Alloy Selection and Design. D. V. Ludwig and R. L. Wood. *Product Engineering*, v. 22, Nov. 1951, p. 184-190.

Precision investment casting has proven to be ideal for many intricate machine parts. Important facts needed for selection of alloys and design of parts which often determine whether a part will be a satisfactory and economical one. (E15)

18-E. Selection Chart for Investment Casting Alloys. D. V. Ludwig. *Product Engineering*, v. 22, Nov. 1951, p. 203, 205, 207.

Covers light metals, Cu-base alloys, low-carbon and low-alloy ferrous alloys, high-temperature alloys, ferrous toolsteels, and stainless steels. (E15)

19-E. On Metal Penetration in Casting. (Report 2). Jiro Kashima. *Reports of the Casting Research Laboratory*, No. 2, 1951, p. 11-14.

Results of investigation for various special steels such as Cr and Mn steels. (E23, AY)

20-E. Relation Between Melting Conditions and Casting Defects in Iron Casting. (Report 1). Nobutaro Kayama. *Reports of the Casting Research Laboratory*, No. 2, 1951, p. 15-19.

See abstract of Japanese version in *Journal of the Casting Institute of Japan*, item 178-E, 1951. (E25, CI)

21-E. Spheroidal Graphite Cast Iron. (Report 1). Takaji Kusakawa, Rikuro Kanda, and Masahiro Kanie. *Reports of the Casting Research Laboratory*, No. 2, 1951, p. 25-32.

Characteristics of the structure. The amount of Mg addition and the effect of section size, i.e. the rate of cooling, are the main factors to explain the mechanism of spheroidal-graphite formation and the process in the foundry. (E25, CI)

22-E. Absorption of Gases in Aluminum Castings. Shigeo Oya. *Reports of the Casting Research Laboratory*, No. 2, 1951, p. 33-37.

An investigation of the factors involved in the occurrence of gas holes owing to the conditions of operation in the process from melting to casting. (E25, Al)

23-E. On Molding Sand Binders. Toshisada Makiguchi. *Reports of the Casting Research Laboratory*, No. 2, 1951, p. 38-41.

The relation between temperature and strength was studied for organic and inorganic binders. (E18)

24-E. On Camlachie Cramp. (Report 1) Especially on Chaplet. Tsunemitsu Muraki. *Reports of the Casting Research Laboratory*, No. 2, 1951, p. 50-53.

Includes consideration of the relation between surface conditions of the chaplet stem and welding, relation between moisture adsorbed by the oxide film, and formation of blowholes, and influence of rust on solid metal. (E25, CI)

25-E. Standardized Components Cut Die Assembly Costs. Robert B. Stanton. *Steel*, v. 129, Nov. 19, 1951, p. 91.

By means of an unusual method of fabricating steel die assemblies with standardized parts, McCulloch Motors Corp., Los Angeles, has been able to save considerable time and money in die casting Al and Mg parts for power-driven chain saws. (E13, Al, Mg)

26-E. Metal Composition and Annealing of Blackheart Malleable Cast Iron. P. H. Shotton. *British Cast Iron Research Association Journal of Research and Development*, v. 4, Oct. 1951, p. 68-72; disc., p. 72-73.

Effect of composition and annealing on the quality of the highest grade of blackheart malleable cast iron specified in B.S.310:1947, as melted in the air furnace or the rotary furnace. C-Si relationship, Mn-S ratio, and P content in relation to the commoner defects occurring in blackheart casting, together with methods of establishing the most suitable composition by adjustments to the furnace charge. Mechanism of the annealing process, and annealing cycle in relation to C and Si content. (E10, J23, CI)

27-E. Production of High Quality Whiteheart Malleable Cast Iron. K. Roesch. *British Cast Iron Research Association Journal of Research and Development*, v. 4, Oct. 1951, p. 74-75; disc., 76-77.

Two methods were explored for development of a high-quality malleable cast iron: secondary annealing to modify pearlite; and melting of a low-S, low-Si malleable cast iron, with increased Mn content. A material of extraordinarily high toughness is obtained by suitable annealing. (E10, J23, CI)

28-E. Basic Refractories. C. S. Hedley. *British Cast Iron Research Association Journal of Research and Development*, v. 4, Oct. 1951, p. 78-83; disc., p. 83-85.

Tabulates composition and properties of a number of basic refractory materials. Principal types for foundry cupolas and ladles. At present, stabilized dolomite brick is the most suitable material for basic cupola linings. A finely ground stabilized dolomite cement is used for patching. (E10)

29-E. The Fluidity of Molten Cast Iron. E. R. Evans. *British Cast Iron Research Association Journal of Research and Development*, v. 4, Oct. 1951, p. 86-139.

Experimental work in the BCIRA laboratories to determine the relative effects of the main factors influencing the fluidity of molten cast iron. A modified form of the spiral fluidity test was adopted. Relative effects of C, Si, and P on fluidity and solidification temperature of various irons. Effects on fluidity of pouring temperature and of Mn, S, Ni, Cu, Cr, Mo, Ti, V, Zr, Al, Te, B, Ce, and Mg. Field tests in four foundries gave results which compared favorably with those obtained in the laboratory. 28 ref. (E25, CI)

30-E. Impregnation Methods Trim Casting Costs. M. Jordan Nathason. *Steel*, v. 129, Dec. 3, 1951, p. 88-89, 110.

See abstract of "Impregnation Cuts Casting Rejects", *Iron Age*, item 496-E, 1951. (E25)

31-E. Shell Molding—Advantages Are Numerous. Bernard M. Ames. *Steel*, v. 129, Dec. 3, 1951, p. 90; *Machine Design*, v. 23, Dec. 1951, p. 239-240. (A condensation.)

The process, its advantages, applications, and limitations. Process utilizes the thermosetting properties of phenolic resins to provide a bond material for silica grains in the construction of a mold. (E19)

32-E. Gates and Heads for Steel Castings. John Howe Hall. *Foundry*, v. 79, Dec. 1951, p. 104-109, 192.

Development of step gating, the application of swirl gates, and the principle of partial or complete reversal of the position of the mold after pouring. (To be continued.) (E22, CI)

33-E. Foundry Core Driers. *Modern Plastics*, v. 29, Dec. 1951, p. 108-109.

Adoption of fibrous glass reinforced polyester resin for driers and core boxes has greatly expanded the use of electronic baking of foundry cores made of sand and urea resin. This eliminates cast Al, which is used for driers in the conventional core-drying operation. (E21)

34-E. Die Casting Die Design. Part V. (Continued.) H. K. Barton and James L. Erickson. *Magazine of Tooling and Production*, v. 17, Dec. 1951, p. 68, 110, 114, 118, 132.

Deals mainly with the die parts known as "overflows." (E13)

35-E. Mechanism of Grain Refinement in Aluminum Alloys. F. A. Crossley and L. F. Mondolfo. *Journal of Metals*, v. 3, Dec. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 191, 1951, p. 1143-1148.

Grain refinement by the addition of small amounts of Ti, Mo, Zr, W, and Cr to Al is caused by the peritectic reaction which, by transforming the intermetallic compound into crystals of Al solid solution, seeds the melt with nuclei above the freezing point of Al. 15 ref. (E25, N2, Al)

36-E. What Is Fluidity? T. P. Yao and V. Kondic. *Metal Industry*, v. 79, Nov. 23, 1951, p. 435-437.

The present position of fluidity testing and additional data which are necessary to interpret the fluidity results. Variables such as metal composition, pouring temperature, and hydrostatic head. (E25)

37-E. Steel Castings. *Iron and Steel*, v. 24, Nov. 1951, p. 493-496.

Layout for varied production at the Grimesthorpe Steel Foundry, England. (E11, CI)

38-E. A Self-Contained Melting and Holding Furnace for Diecasting Foundries. *Machinery Lloyd* (Overseas Edition), v. 23, Nov. 10, 1951, p. 89, 91.

Outstanding advantages include low initial and maintenance costs, as well as extremely pleasant working conditions for the die caster, due to the convenient height, absence of flame and reduced radiation. Starting up is rapid and the metal used can quickly be changed. (E13)

39-E. Mechanical Charging of Cupolas. W. J. Driscoll. *Foundry Trade Journal*, v. 91, Nov. 15, 1951, p. 551-560; Nov. 22, 1951, p. 597-605; Nov. 29, 1951, p. 629-633; disc., p. 633-637.

Previously abstracted from *Institute of British Foundrymen*, Paper 1009, 1951. See item 428-E, 1951. (E10, CI)

40-E. Production of Heavy Castings for Electrical Generating Equipment. N. Charlton. *Foundry Trade Journal*, v. 91, Nov. 22, 1951, p. 585-590; disc., p. 590-593.

Methods and procedures. (E11, CI)

41-E. Core Sand Collapsibility Test. I. J. Birch. *Foundry Trade Journal*, v. 91, Nov. 22, 1951, p. 595-596.

Test for assessing the collapsibility of various types of core binders. Core sands tested were Al core sands, hence RR-50 alloy was used in all tests. (E18, Al)

42-E. Balanced Cores in Production Moulding. F. H. Wakeham. *Foundry Trade Journal*, v. 91, Nov. 29, 1951, p. 627.

An application and method of

preventing misplacement of balanced cores in production molding. (E19)

43-E. Temperature of Molds and of Filling the Mold. (In French.) R. Grunberg. *Métallurgie et la Construction mécanique*, v. 83, Oct. 1951, p. 753, 755, 757.

Temperature influences on the surface, mechanical characteristics, dimensions of the casting, and factors influencing the rate of filling the molds used in die casting. Data for Zn and Al and their alloys are charted and tabulated. (E13, Al, Zn)

44-E. Composition and Utilization of Blast-Furnace Gas From Small Cupola Furnaces. (In German.) K. Roesch. *Giesserei*, v. 38, Oct. 4, 1951, p. 526.

Critically discusses article by W. Chrétien-Horand (item 313-E, 1951). Finds that values given by author, especially concerning CO content, cannot be generalized. (E10, CI)

45-E. Mechanization of a Gravity Die-Casting Foundry. (In Italian.) *Alluminio*, v. 20, Sept. 1951, p. 351-354.

Operation of foundry for light alloys. Reductions in working time warrant costs considerably lower than those of a normal plant. (E13, Al, Mg)

46-E. The Theory of the Cupola Process. (In Swedish.) H. Jungbluth. *Gjuteriet*, v. 41, Sept. 1951, p. 127-132.

Points out that it is possible to treat mathematically the factors controlling cupola process. A basic formula shows melting rate as a function of blast volume, coke ratio, and rate of combustion. A modification of this formula makes it possible to predict the influence of preheated blast and oxygen enrichment on the melting process. The relationships are represented graphically. (E10, CI)

47-E. Cupola Patching With Air Gun. (In Swedish.) Olof Göransson. *Gjuteriet*, v. 41, Sept. 1951, p. 133-136.

The cost of repair of the 40-in. diam. cupolas in the author's foundry has been reduced considerably by introduction of an air-placement machine. Cost figures and other specific data offer conclusive evidence that the air-placement process is superior to hand patching. (E10)

48-E. Centrifugal Casting of Molten Metals. (In Czech.) Jan Kieswetter. *Hutnicke Listy*, v. 6, Aug. 1951, p. 369-376; Sept. 1951, p. 424-428.

Theoretical principles of mold preparation and for rate of spinning. Positioning of the mold cavity, the gating system, and vents for gas removal. (E14)

49-E. Pressure Casting. (In Portuguese.) Renato Refinetti. *Boletim da Associacao Brasilerira de Metais*, v. 7, July 1951, p. 409-426.

Machines and equipment; alloys used; materials for dies used in the process. (E16, T5)

50-E. (Pamphlet) **Advantages of the Gray Iron Casting Process and Products.** C. O. Burgess. 28 pages. Gray-Iron Founders Society, Inc., 210 National City—East 6th Bldg., Cleveland 14, Ohio. $1.00.

The many advantages which can accrue to the engineer, designer, and manufacturer through use of gray-iron castings. Biased in favor of castings, as opposed to weldments, forgings, and other fabrication methods, but well supported by factual material. (E11, CI)

F

PRIMARY MECHANICAL WORKING

1-F. Rolls and Rolling. Part XXX. Tees. E. E. Brayshaw. *Blast Furnace and Steel Plant*, v. 39, Nov. 1951, p. 1354-1357.

Roll-pass diagrams. (F23)

2-F. New Rolling Method Eliminates Surface Defects. Norman C. Rendieman. *Iron Age*, v. 168, Nov. 15, 1951, p. 122-124.

How diamond and square rolling are used to eliminate deep seams, spongy surfaces, and other defects in semifinished products on secondary mills. Scarfing and chipping to remove defects are not necessary to produce a good product, even in the difficult bessemer grades, when using this rolling method. (F23, ST)

3-F. Application of Precast Insulation to Water-Cooled Supports in Underfired Furnaces. James E. Hovis. *Iron and Steel Engineer*, v. 28, Nov. 1951, p. 69-72; disc., p. 72.

How precast insulation can result in fuel savings up to 20% and increase production as much as 10%. Refers to furnaces used to heat steel prior to rolling. (F21)

4-F. Instrumentation for Improved Rolling Temperature Control. L. D. Culp. *Iron and Steel Engineer*, v. 28, Nov. 1951, p. 85-90; disc., p. 90-91.

The important part that temperature plays in the rolling of quality steel product. Instrumentation that is available for measuring, indicating, and recording these temperatures. (F23, S16, ST)

5-F. Magnetic Amplifier Control for Rolling Mills. *Iron and Steel Engineer*, v. 28, Nov. 1951, p. 112, 114, 118, 120.

A pilot-plant demonstration showing the possibilities of magnetic amplifier control. (F23, S18)

6-F. New Heavy Forge at Hadfields Ltd. *Metal Industry*, v. 79, Nov. 9, 1951, p. 395-398.

Forging presses and furnaces. (F22)

7-F. On Plastic Deformation Process of Compression of Metals Under High Speed. Hiroshi Yamanouchi and Yuji Matsuura. *Reports of the Casting Research Laboratory*, No. 2, 1951, p. 7-10.

Measurements were made of hammer movements in forging of Pb. Compressive displacement-time curves were mathematically analyzed and fundamental relations between the resistance to deformation, deformation speed corresponding to work done, and deformed shapes of the test pieces were analyzed. (F22, Q23, Pb)

8-F. British Experience With the Counterblow Forging Hammer. Paul Granby. *Steel Processing*, v. 37, Nov. 1951, p. 562-566, 585.

(F22, ST)

9-F. Rare Earths Improve Forgeability of Stainless. E. B. Post, D. G. Schoffstall, and H. O. Beaver. *Iron Age*, v. 168, Dec. 6, 1951, p. 162-163.

Use of the rare-earth elements to improve the hot workability of austenitic Cr-Ni and high-alloy stainless steels. Effect is exceptionally marked in some alloys where the metal is converted into a commercial wrought product from a metal previously considered to be non-hot workable. In other metals, the effect is to improve existing hot workability as evidenced by better ingot-to-billet yields, less billet preparation, and better hot rolled strip surfaces. (F22, F23, SS, EG-g)

10-F. Hot and Cold Forging Methods. C. W. Hinman. *Modern Machine Shop*, v. 24, Dec. 1951, p. 132-134, 136, 138, 140, 142.

First of a series of articles which will deal with equipment and methods. (F22)

11-F. The Heating of Rounds for Piercing. W. Trinks. *Industrial Heating*, v. 18, Nov. 1951, p. 2023-2024, 2026, 2028, 2030, 2032, 2034, 2036.

"Piercing" refers to the cross-rolling process in which an internally weakened round bar with a partially disintegrated center is forced over a piercer-point. The process is known as the Mannesmann process. Furnaces are described and schematically diagrammed. (F21)

12-F. Cerium and Lanthanum Improve Hot Workability of Stainless. C. B. Post, D. G. Schoffstall, and H. O. Beaver. *Steel*, v. 129, Dec. 10, 1951, p. 88-91.

Alloy additions of Ce and La in the range 0.08-0.18% were found to improve hot workability of Ni-Cr-Mo-Cu and other high-alloy stainless steels. (F22, SS, SG-g-h)

13-F. Use Glass As Heat Source in Metal Processing. *Ceramic Industry*, v. 57, Dec. 1951, p. 83-84.

The principles of using molten glass, melted and kept molten electrically, as a source of heat for furnaces where high temperatures are required. Method is said to be practical for annealing strip, heating ingots and cold billets, if power cost is low. (F21, J23)

14-F. Electroweld Tube Mill Rolls High Speed Quality Mill Product. *Steel Equipment & Maintenance News*, v. 4, Nov. 1951, p. 15.

In one continuous, automatic operation, the AEF tube mill converts steel strip into welded tubing. (F26, ST)

15-F. Presses for the Jet Age. *Fortune*, v. 44, Dec. 1951, p. 110-113, 146, 148.

The role of closed-die forging presses of the size 25,000 to 50,000 tons in the production of modern planes. U. S. deficiency in forging and extrusion presses. (F22, F24, G1)

16-F. Heavy Forge Shop at Hadfields Limited, Sheffield. *Engineering*, v. 172, Nov. 16, 1951, p. 616-619. (F22)

17-F. French Sheet Steel. *Iron and Steel*, v. 24, Nov. 1951, p. 500.

French continuous cold rolling mill for the production of thin sheet. Pickling and tempering operations are stressed. (F23, L12, J29, ST)

18-F. Cooling Beds for Bar Mills. W. Udall. *Journal of the Iron and Steel Institute*, v. 169, Nov. 1951, p. 257-276.

Evolution of the merchant bar mill during the last 50 years. Several of the earlier and later types of cooling bed and bed mechanisms and various factors governing their location and operation. Theoretical and practical observations relating to thermal treatment and cooling capacity. Suggestions regarding possible future developments. (F23, ST)

19-F. Induction Heating in the Drop-Forging Industry. G. W. Seulen. *Metal Treatment and Drop Forging*, v. 18, Nov. 1951, p. 483-489.

Various induction heating units for use in forging; their advantages and disadvantages. (F21, F22)

20-F. New Plant for the Production of Heavy Steel Forgings; Developments at Hadfields Limited. *Metallurgia*, v. 44, Oct. 1951, p. 245-252.

Salient features of the Hatfields Ltd., plant, including reheating, forging, and heat treatment facilities. (F22, ST)

21-F. Copper and Brass Tubes. Leonard F. White. *Australasian Engineer*, Oct. 8, 1951, p. 65-69.

A summary of the principal uses of copper and brass tubes and the most commonly used alloys. A general account of the most important methods of manufacture. (F26, Cu)

22-F. Contribution to the Problem of Cracking During Size Reduction of Steel Wire. (In German.) Wilhelm Püngel. *Stahl und Eisen*, v. 71, Oct. 25, 1951, p. 1137-1140.

Cracking of wire during hammer-mill reduction. Effect of rotation rate of the hammers on twisting of the cores of the wires was determined. Means of avoiding this type of failure. (F28, ST)

23-F. Temperature Measurement by Means of a Wire-Die Thermocouple During Wire Drawing. (In German.) Werner Lueg. *Stahl und Eisen*, v. 71, Oct. 25, 1951, p. 1140-1145; disc., p. 1145-1147.

Describes and diagrams apparatus. Patented steel wire was studied. Effect of reduction rate, sequence of drawing operations, friction due to springiness, die bearing length, plastic properties, strain hardening, drawing speed and lubricant, and wire quality were determined. (F28, S16, ST)

24-F. Shaping and Measurement of Die Contour. (In German.) Viktor Domes. *Stahl und Eisen*, v. 71, Oct. 25, 1951, p. 1147-1148.

Refers to wire-drawing dies. Diagrams show the principles of various methods for study of die contour. 11 ref. (F28)

25-F. Drawing Capacity and Output Requirements of the Multiple Two-Bar Drawing Process. (In German.) Anton Mackert. *Stahl und Eisen*, v. 71, Oct. 25, 1951, p. 1156-1160; disc., p. 1160-1161.

Reconstruction of a 40-ton drawbench for 2-bar drawing. Details of operating procedures. Power input was investigated for three speed ranges in single and 2-bar drawing of different steels. (F27, ST)

26-F. Critical Analysis of Various Theories of Rolling. (In Polish.) Z. Wusatowski. *Prace Glownego Instytutu Metalurgii*, v. 3, no. 5, 1951, p. 389-416.

Reviews recent theories of the rolling process. Friction during the rolling process. The theories of Nadai, Celikoff, and Orowan. The theory of Orowan is analyzed on the basis of published reports. 27 ref. (F23)

27-F. (Book) **The Seamless Story.** J. Perc Boore. 285 pages. Commonwealth Press, Inc., 1507 De Long St., Los Angeles 15, Calif. $5.75.

Story of the Mannesmann and Stiefel piercing patent in Germany. History of the seamless steel tube industry in the United States, including the story of Shelby Steel Tube Co. and the individual tube companies that Shelby absorbed. Brief history of contemporary mills, as well as biographical sketches of important personalities in the industry. (F26)

G

SECONDARY MECHANICAL WORKING

1-G. Stretch-Forming: Final Properties Achieved in the Material; Tendency to Grain-Growth. G. B. Evans. *Aircraft Production*, v. 13, Nov. 1951, p. 332-334.

Results of experiments on Al alloys. Only in the case of material stretched and without further heat treatment can the final properties be estimated with reasonable assurance, assuming the material to be normal to start with. In all other cases grain growth may set in if control is not exercised. 11 ref. (G9, Al)

2-G. These Clips Iron Out Drawing Wrinkles. Jerry S. Adams. *American Machinist*, v. 95, Nov. 12, 1951, p. 137.

Wrinkle defects around the edges of products made by the Guerin process have been eliminated by use of clips. Used on either stretch or shrink flanges, the sandwich clips prevent cracks even on severe stretch jobs by controlling metal flow under the rubber mat. (G8)

3-G. Metallurgical Considerations in Machining. V. How Workpiece Structure Affects Tool Life. Milton C. Shaw and Prescott A. Smith. *American Machinist*, v. 95, Nov. 12, 1951, p. 138-141.

Behavior of carbon steels, alloy steels, austenitic materials, and cast irons. (G17, M27, CN, AY, SS, CI)

4-G. Cutting Speeds May Double or Triple When Science Guides Machining. E. J. Tangerman. *American Machinist*, v. 95, Nov. 26, 1951, p. 144-147.

Cutting speeds, fluids, and temperatures. Tests on three common high-temperature alloys, Inconel X, Timken 16-25-6 and S-816. Bibliography on machinability and high-speed machining. 50 ref. (G17, Ni, SG-h, AY)

5-G. Choose Your Metal-Cutting Fluids With Care. Leon Salz. *American Machinist*, v. 95, Nov. 12, 1951, p. 159-162.

What cutting fluids are and what they do. Money-saving tips. (G21)

6-G. Dynamometer for Torque and Thrust Due to Drilling. R. C. Brain and H. J. Hulf. *Engineering*, v. 172, Oct. 19, 1951, p. 487-488.

Drill dynamometer which was designed and constructed at the Sundbury research station of the Anglo-Iranian Oil Co., Ltd. is used for measuring torque and thrust loads exerted by twist drills, and has proved to be of considerable value in research into the behavior of cutting fluids during drilling operations. (G17)

7-G. Flame Cutting. Robert Sibley. *Iron Age*, v. 168, Nov. 15, 1951, p. 117-119.

Compounded hydrocarbon, combined with oxygen, cuts cleanly any armor plate thickness, leaving it ready for welding without further finishing. Speeds are average for flame cutting and a newly designed torch nozzle is the only special equipment required. Bevel edge angles as low as 20° are easily flame cut. (G22, ST)

8-G. Method of Machining Hard Metals Utilizes Electrical Energy. John S. Roller. *Machine and Tool Blue Book*, Dec. 1951, p. 127-128, 130, 132, 134, 136.

See abstract of "A New Method of Machining", *Iron and Steel Engineer*, item 378-G, 1951. (G17)

9-G. Shot Peening as a Factor in the Design of Gears. John C. Straub. *Machine and Tool Blue Book*, Dec. 1951, p. 163-166, 168, 170.

Effects on strength, and pitting and scoring resistance. (G23, Q23, Q29, ST)

10-G. It's Easy to Bend. *Machine and Tool Blue Book*, Dec. 1951, p. 209-210, 212, 214-218, 220.

Increased knowledge of the cold bending of metals and recent improvements in bending machines. Product design, material selection, types of bending machines, special devices for bending, bending of shapes, and loop and spiral bending. (G6)

11-G. Cold Headed Parts. Philip O'Keefe. *Materials & Methods*, v. 34, Nov. 1951, p. 85-100.

Bolts, screws, rivets, nails, nuts, electrical terminals, anti-friction bearing balls and rollers, and other small metal parts are mass produced by cold heading. Manufacturing, metallurgical, and cost factors which must be considered to specify cold heading or to design cold headed parts. Production methods and machines; headability of metals and alloys; design of cold headed parts; and competitive place of cold heading. (G10)

12-G. Sheet Stock: Ideas to Help Stretch It. *Modern Industry*, v. 22, Nov. 15, 1951, p. 39-47.

New machines, new ways to handle materials, to help conserve short supplies, and to cut costs. Applications to steel, Al, and Cu. (G1, ST, Al, Cu)

13-G. Bandsawing Light Metal Castings. *Modern Metals*, v. 7, Nov. 1951, p. 52.

Tabular data on production bandsawing of Al and Mg castings. (G17, Al, Mg)

14-G. Impact Extrusion of Magnesium. T. L. Patton. *Modern Metals*, v. 7, Nov. 1951, p. 54-57.

See abstract under similar title from *Iron Age*, item 329-G, 1951. (G5, Mg)

15-G. On the Improvement for the Machinabiilty of Cast Al Alloys. Fusao Hayama. *Reports of the Casting Research Laboratory*, No. 2, 1951, p. 20-24.

For improvement of the surface-finishing properties of cast Al alloys, Bi and Sn have a similar effect. The tensile strength of the Al alloy containing Sn is slightly lower, but yield point and extension are not changed. The effect of heat treatment is scarcely changed by addition of Sn, and surface finish of the heat-treated alloy is better than the alloy that is not heat treated. (G17, Q general, Al)

16-G. Designing Carbide Dies. M. L. Backstrom and E. J. K. Reitler. *Machinery* (London), v. 79, Nov. 8, 1951, p. 795-801.

Mechanical properties of the material in the dies. Application to blanking, piercing, forming, and drawing of various materials. (G general, T5, C-n)

17-G. Single Draw Produces Silicon-Copper Hemispheres. James A. Leake. *Iron Age*, v. 168, Nov. 29, 1951, p. 84-85.

Three dies in one stroke of a large hydraulic press perform three operations required to make finished hemispheres. Yield is thus one finished piece per stroke. Formerly, three draws, interstage annealing, restrike, trim and piece operations were required. After press operations, the draw parts are stress relieved. (G4, J1, Cu)

18-G. Use of Oxy-Acetylene in Pipe Fabrication. E. P. Auler. *Steel Processing*, v. 37, Nov. 1951, p. 555-559; *Industry & Welding*, v. 24, Dec. 1951, p. 34-36, 78-80.

Use as a convenient source of localized heat. Oxy-acetylene cutting torch, gouging torch, and flame of a heating torch. (G22, J2, ST)

19-G. Airframes Come to San Leandro. James Blane. *Western Machinery and Steel World*, v. 42, Nov. 1951, p. 78-81.

Miscellaneous fabrication equipment and procedures of Kaiser Mfg. Co. in production of parts for Lockheed's Neptune patrol bombers. Includes presswork, heat treatment, surface finishing, machining, and riveting. (G general, J general, K13, L general, T24)

20-G. Controlled Pressure Aids Deep Drawing. Wm. M. Stocker, Jr. editor. *American Machinist*, v. 95, Dec. 10, 1951, p. 138-142.

Advantages and disadvantages of two recently developed sheet-metal forming processes: Marforming and Hydroforming. (G1, G8)

21-G. Contour Turning. A Special American Machinist Report to the Metalworking Industries. Miles J. Rowan. *American Machinist,* v. 95, Dec. 10, 1951, p. 149-172.

An over-all picture of modern tracer-controlled turning. Basic tracing systems and how they operate. Limitations; job studies. (G17)

22-G. Surface Grinding of Titanium. Leo P. Tarasov and Gordon T. Rideout. *American Machinist,* v. 95, Dec. 10, 1951, p. 183, 185.

Beneficial effects of low wheel speed obtained with vitrified-bonded wheels on a small surface grinder. (G18, Ti)

23-G. Formability of Titanium Investigated. O. A. Wheelon. *Iron Age,* v. 168, Dec. 13, 1951, p. 140-143.

In general, Ti forms like Mg and machines like stainless steel. Most forming must be done hot. Studies included use of stretch forming, the Hydropress, power brakes, rolls, and planishing hammers. (G general, Ti)

24-G. Butt Brazing Carbide Tools Without Tip Pockets. David Kauffman. *Tool Engineer,* v. 27, Dec. 1951, p. 33-36.

Methods which may be used to eliminate the strains caused by butt brazing. (G8, T6, C-n)

25-G. Stainless Fabricating Methods Successfully Form Titanium Sheet. *Steel,* v. 129, Dec. 17, 1951, p. 94-95, 110.

How machines and procedures used to form intricate stainless structures can be adapted to shape Ti. In studies completed recently at Ryan Aeronautical Co.'s development laboratories, flat Ti sheet was formed to complex shapes. An experimental production procedure to determine the behavior of titanium when welded, formed, and heat treated. (G4, Ti)

26-G. Honed Edges Cure Carbide Ailments. Charles Frank. *Steel,* v. 129, Dec. 17, 1951, p. 106.

Some of the principal troubles encountered with carbide in the machining of ferrous metals. Suggestions on how to limit the difficulties. (G17, Fe, C-n)

27-G. Cutting Oils. A. E. Williams. *Mining Magazine,* v. 85, Nov. 1951, p. 279-282.

Properties and uses. Compares results of cutting with and without oil. (G21)

28-G. Precision and Eccentric Shapes Require Unusual Methods in Making Stainless Pipe. Fred M. Burt. *Western Metals,* v. 9, Nov. 1951, p. 42-43.

Equipment and procedures used by Standard Steel Corp., Los Angeles. Processes include resin coating, shearing, sawing, roll forming, Heliarc welding, and torch cutting. (G general, K1, L26, SS)

29-G. Putting the Squeeze on Steel. Richard Cheney. *Steelways,* v. 7, Nov. 1951, p. 18-20.

A cold-forming process developed in Germany during World War II. Giant presses are used. (G1, ST)

30-G. Method X. Frances M. Campbell. *Steelways,* v. 7, Nov. 1951, p. 28-29.

A metal-shaping process that tackles the hardest of alloys. When a spark jumps between a brass electrode and a piece of tungsten carbide or other hard metal, a hole is made in the latter. (G17, C-n)

31-G. Grinding Methods Evolved for Titanium. *Journal of Metals,* v. 3, Dec. 1951, p. 1128-1129.

Results, showing the unexpected beneficial effects of low wheel speed, were obtained solely with vitrified bonded wheels on a small surface grinder. It is possible that similar results will be obtained with vitrified bonded wheels in other precision operations such as cylindrical or internal grinding, but experiments have not yet verified this assumption. (G18, Ti)

32-G. Magnet Yokes Made Rapidly on High Precision Basis. Herbert Chase. *Magazine of Tooling and Production,* v. 17, Dec. 1951, p. 49-51, 55, 72, 76.

Setups which perform blanking, deburring, tapping, forming, projection welding, and broaching operations on large quantities yet hold the close dimensions essential for a quality product. (G1, G17, K3)

33-G. Directional Variation of Grinding Hardness in Silicon Carbide (SiC). J. A. Kohn. *Industrial Diamond Review,* new ser., v. 11, Oct. 1951, p. 211-212; Nov. 1951, p. 235-237.

Data were obtained with standard diamond-grinding equipment, using SiC as the abrasive. Results indicate that cleavage plays an important role. (G18, C-n)

34-G. Powder Washing for Metal Removal. R. S. Babcock. *Canadian Metals,* v. 14, Nov. 1951, p. 22-27.

New tool for removal of excess and defective material from steel castings. The method uses powder and oxygen-gouging equipment for washing out sand inclusions, scabs or penetrations, and burned core sand. (G22, CI)

35-G. Methods of Shaping Cemented Carbides. *Machinery* (London), v. 79, Nov. 22, 1951, p. 882.

(G general, C-n)

36-G. Heavy Hydraulic Presses. *Engineer,* v. 192, Nov. 23, 1951, p. 670.

Special equipment for the preparation of plates for use in heavy welding fabrications. Includes 750-ton hydraulic flanging and joggling press and 3600-ton hydraulic vertical plate bending machine. (G6, ST)

37-G. Economic Effects of Cemented Carbide Alloys Upon Machining and Chipless Forming. (In German.) Julius Holzberger. *Stahl und Eisen,* v. 71, Oct. 11, 1951, p. 1098-1102.

Recent developments, including review of the literature. 11 ref. (G17, T5, C-n)

38-G. A New Heavy-Duty Light-Metal Machining Alloy as an Example of the Application of Experiences With Bearings to the Machining Process. (In German.) A. Röhenbeck. *Metall,* v. 5, Nov. 1951, p. 486-489.

Theoretical basis and experimental development of Al alloys fulfilling the four prerequisites of machining alloys. The cutting edge is lubricated by liquid metal (lead). Experiments with "Ledloy" confirm the conclusions presented. 10 ref. (G17, Al)

39-G. (Book) **Machining of Stainless Steel.** 27 pages. Metal Cutting Tool Institute, 405 Lexington Ave., New York 17, N. Y. $1.00.

Composition and general characteristics of wrought stainless steels, practical considerations in machining, tool design, and lubricants. (G17, SS)

40-G. (Book) **Machining Alcoa Aluminum.** 68 pages. 1951. Aluminum Co. of America, Gulf Bldg., Pittsburgh 19, Pa.

Specific, desirable characteristics in tools for machining aluminum and its alloys; speeds, feeds, and depths of cuts which will operate these tools satisfactorily; where common practice as well as tools of standard design may be used; and where the use of special practices or tools will produce better results. (G17, Al)

41-G. (Book) **Forming Alcoa Aluminum.** 77 pages. 1951. Aluminum Co. of America, Gulf Bldg., Pittsburgh 19, Pa.

Recommended procedures for blanking and piercing, drawing, embossing, coining, stamping, spinning, tube and shape bending, and other mechanical forming methods. (G general, Al)

42-G. (Book) **The Grinding Wheel.** Kenneth B. Lewis, 405 pages. 1951. The Grinding Wheel Institute, Greendale, Mass.

A textbook of modern grinding practice by a consulting engineer, well known especially in the wire industry. While it exhaustively treats such subjects as abrasive materials, shapes and wheels, machines for cylindrical, centerless, gear, and other types of grinding, it also has adequate chapters on evaluation of surface quality, "superfinish", and design considerations. E.E.T. (G18)

H

POWDER METALLURGY

1-H. The Manufacture of Cemented Tungsten Carbide. B. E. Berry. *International Chemical Engineering & Process Industries,* v. 32, Nov. 1951, p. 533-537.

Reprinted from *Murex Limited Review,* item 54-H, 1951. (H general, W, C-n)

2-H. Sintered Aluminum of High Heat Resistance. (In French.) Roland Irmann. *Revue de l'Aluminium,* v. 28, July-Aug. 1951, p. 269-275; Sept. 1951, p. 311-316.

Various processes for obtaining pure Al powders and sintering them. Constitution, shape, and oxide content of the powders. Mechanical and physical properties are tabulated and charted. Structures of the powders. Applications. (H general, Al)

3-H. Stainless Steel Powder for Mechanical Parts. Arthur H. Grobe and Raymond Hoffman. *Product Engineering,* v. 22, Dec. 1951, p. 168-172.

Type 316 powder can be pressed and sintered at pressures and temperatures which are commercially feasible. Mechanical properties of the finished parts. Applications. (H14, H15, Q general, T7, SS)

4-H. Refractory Bodies Composed of Boron and Titanium Carbides Bonded With Metals. James A. Nelson, Tracy A. Willmore, and Raymond C. Womeldorph. *Journal of the Electrochemical Society,* v. 98, Dec. 1951, p. 465-473.

Mixtures of various carbides in finely divided form were compacted with Ni, Fe, Co, Ti, or Cr and fired in an argon atmosphere at temperatures between 1925 and 2065° C. Reactions occurring between the carbides and metals. Compositions showing the greatest promise for further work. Strength properties are tabulated. (H14, Q23, C-n, B, Ti, Co, Cr, Fe, Ni)

5-H. Developments in the Technique of Manufacturing Cemented-Carbide Alloys. (In German.) Carl Ballhausen. *Stahl und Eisen,* v. 71, Oct. 11, 1951, p. 1090-1097.

Development of electric furnaces for production of cemented carbides, especially the carbon-tube furnace. Developments in mixing, crushing, grinding, screening, drying, shaping, and sintering. Equipment. (H12, H14, H15, C-n)

6-H. The Properties of Sintered-Iron Parts as Related to the Types of Powders Used and Their Processing Conditions. (In German.) *Stahl und Eisen,* v. 71, Oct. 11, 1951, p. 1103-1114.

Comprehensive correlated summary of such properties as corner strength, shrinkage, surface conditions, oxygen content, chemical purity, compressibility, mechanical properties, densities of various Fe powders. Compacting and sintering processes and mechanical properties of the sintered parts. 22 ref. (H11, H14, H15, Fe)

J

HEAT TREATMENT

1-J. Heat-Treatment of Grey Cast Iron. *Foundry Trade Journal,* v. 91, Nov. 1, 1951, p. 517-518.

Discussion of Report of Sub-Committee T. S. 31 of Institute of British Foundrymen. See item 203-J, 1951. (J general, CI)

2-J. Flame Hardening Proves Versatile Heat Treating Method. Stephen Smith. *Iron Age,* v. 168, Nov. 22, 1951, p. 96-98.

Close control of surface hardening and depth of hardness is possible with the flame hardening setup at National Forge & Ordnance Co. Large or small areas are surface hardened with equal facility and less expense than with other comparable means. (J2, ST)

3-J. Heat Treating the Carburizing Grades of Boron Steels. Kenneth Rose. *Materials & Methods,* v. 34, Nov. 1951, p. 66-68.

Avoiding excessive core hardenability and obtaining satisfactory case hardness in large-section parts are major problems. Recommended procedures. Experiences of several companies. (J28, AY)

4-J. Effects of Some Solution Treatments Followed by an Aging Treatment on the Life of Small Cast Gas-Turbine Blades of a Cobalt-Chromium-Base Alloy. II. Effect of Selected Combinations of Soaking Time, Temperature, and Cooling Rate. C. A. Hoffman and C. F. Robards. *National Advisory Committee for Aeronautics,* Technical Note 2513, Oct. 1951, 19 pages.

Investigated for Haynes Stellite Alloy 21. Six heat treatments were studied. The treatments were followed in each case by aging at 1500° F. for 72 hr. Twenty blades taken from each of the six heat treated groups, together with 22 as-cast blades, were assembled in a small gas turbine. (J27, Co, SG-h)

5-J. Comparative Surface-Hardening Characteristics of Commercial Pearlitic Malleable Irons. S. H. Bush, W. P. Wood, and F. B. Rote. *Transactions of the American Society of Mechanical Engineers,* v. 73, Nov. 1951, p. 1093-1099.

See abstract of "Pearlitic Malleable Irons Can Be Successfully Surface Hardened," *Materials & Methods,* item 114-J, 1951. (J2, CI)

6-J. The Martempering Treatment for Reducing Distortion and Cracking. J. Lomas. *Machinery Lloyd* (Overseas Edition) v. 23, Oct. 27, 1951, p. 84-88.

Describes the above. The process is of particular value for tools where dimensional stability is important. It has also been used widely for other steel components. (J26, ST)

7-J. On Austenitic Malleable Cast Iron. (Report 1). Nobuhisa Tsutsumi. *Reports of the Casting Research Laboratory,* No. 2, 1951, p. 42-45.

Research directed toward getting blackheart malleable cast iron by one-stage annealing. Tensile strength and hardness values of this cast iron. (J23, Q27, Q29, CI)

8-J. Batch Furnaces Achieve Continuous Production Rates. George Brailsford. *Steel,* v. 129, Dec. 3, 1951, p. 86-87.

See abstract of "Continuous Production Assured With Batch Furnaces", *American Machinist,* item 254-J, 1951. (J26, J29)

9-J. Production Heat Treating With Batch Furnaces. George Brailsford *Steel Processing,* v. 37, Oct. 1951, p. 569-571.

Features of the Atmotrol muffle furnaces. Parts were forged from SAE 8640 and SAE 1035 stock. See also items 254-J, 1951 and 8-J, 1952. (J26, J29, ST)

10-J. Production Non-Ferrous Wire Annealing at Bridgeport Brass. *Steel Equipment & Maintenance News,* v. 4, Nov. 1951, p. 12.

Includes a schematic drawing showing the construction of the finish annealing furnace. (J23, Cu)

11-J. Heat Treatment and Pickling of the Stainless Steels. Lester F. Spencer. *Magazine of Tooling and Production,* v. 17, Dec. 1951, p. 52-55, 72, 76.

An illustrated survey. (J general, L12, SS)

12-J. Heat Treatment of Metals. Part II. Carroll B. Mershon. *Industrial Heating,* v. 18, Nov. 1951, p. 2002, 2004, 2006.

Special operations, including austempering (interrupted quenching), carburizing, nitriding, and flame hardening of metals. Equipment for fuel-fired furnaces, furnace atmospheres and agents, and temperature measurement. (J26, J28, J2, S16)

13-J. Canada's Largest Stress Relieving Furnace Installed at Dominion Bridge. *Canadian Metals,* v. 14, Nov. 1951, p. 30. (J1)

14-J. Flame Hardening for Economic Heat Treating. Edwin F. Green. *Canadian Metals,* v. 14, Nov. 1951, p. 36-38, 40.

Process and equipment, its applications, and advantages. Confined to steels and cast irons. (J2, ST, CI)

15-J. Stamps, Dies and Punches; Treatment and Metallurgical Control at Edward Pryor & Son, Ltd. *Iron and Steel,* v. 24, Nov. 1951, p. 523-526.

How strict metallurgical control maintains high mechanical properties and dimensional accuracy. (J general, Q general, T5, ST)

16-J. The Surface Hardening of Steel. Part X. Cyaniding Practice. G. T. Colegate. *Metal Treatment and Drop Forging,* v. 18, Nov. 1951, p. 507-514.

Influence of bath compositions and treatment after cyaniding on the properties of the case formed. Specialized processes, including Chapmanizing, dry cyaniding, and the Ni-carb process. (To be continued.) (J28, ST)

17-J. Study of the Thermal Treatment of Duralumin. (In French.) Pierre Laurent and Henri Jarlan. *Revue de Métallurgie,* v. 48, Oct. 1951, p. 759-764.

Influence of rate and temperature of hardening on the hardness of a treated duralumin. (J27, Q29, Al)

18-J. Recommended Heating and Holding Times in the Practical Annealing and Heat Treatment of Steels. (In German.) Walter Hülsbruch. *Stahl und Eisen,* v. 71, Nov. 8, 1951, p. 1219-1225.

Investigated for five low-alloy steels. Effects on grain size and toughness were determined. 28 ref. (J23, Q23, AY)

19-J. Reduction of Inherent Welding Stresses by Means of Progressive Heating Below 200° C. (In German.) K. Wellinger and N. Ludwig. *Schweissen und Schneiden,* v. 3, Nov. 1951, p. 344-347.

Reviews earlier methods and American experiments leading to a method for reduction of inherent welding stresses in steels by localized heating. German tests verifying the American results. 18 ref. (J1, ST)

20-J. Investigation on the Suitability of Steel and Cast Iron for Case Hardening by High-Frequency Currents. (In Polish.) F. Staub and K. Pogorecki. *Prace Glowneno Instytutu Metalurgii,* v. 3, no. 5, 1951, p. 375-387.

Results of investigations on the case hardening of steel, steel castings, and cast iron by induction heating with high-frequency currents. Effect of surface temperature on hardness of the surface layer, as well as effect of heating on depth of hardening. (J28, ST, CI)

21-J. Comparative Study of Thermal Treatments of Steel and Their Definitions. (In Portuguese.) Werner Grundig. *Boletim da Associacao Brasileira de Metais,* v. 7, July 1951, p. 283-320.

Taking as a basis microstructures met in heat treated steel, attempts to define various heat treatment processes, describing the formation and characteristic microstructures encountered. 14 ref. (J general, M27, ST)

22-J. (Book) **An Evaluation of the Hardening Power of Quenching Media for Steel.** E. J. Eckel, R. M. Mayfield, G. W. Wensch, and F. A. Rough. 131 pages University of Illinois, Urbana, Ill. $1.50.

A survey of 30 quenching mediums. (J2, ST)

K

JOINING

1-K. Hot Air "Welds" Plastics. Frank Charity. *American Machinist,* v. 95, Nov. 12, 1951, p. 164-165.

Thermoplastics, Pb-Bi alloys, low-melting-point solder, and other materials which melt or soften at temperatures of less than 650° F. are being joined by means of recently developed "hot-jet" equipment. (K6, SG-d)

2-K. Automatic Welding in Steel Plant Maintenance. William P. Hoffman. *Blast Furnace and Steel Plant,* v. 39, Nov. 1951, p. 1348-1353.

Equipment and procedures for miscellaneous repair and resurfacing jobs. (K1, CN)

3-K. Brazing and Welding Copper and Aluminium for Electrical Connections. E. V. Beatson. *Engineer,* v. 192, Oct. 19, 1951, p. 501-503; Oct. 26, 1951, p. 533-535.

Recommended procedures and equipment. Characteristics of different heating methods and brazing alloys. First installment: Torch brazing Cu to Cu; carbon resistance brazing; direct interfacial-resistance brazing; and silver-coating brazing of Cu and Cu alloys. Second and concluding installment: Zn-coating brazing of steel to Cu, brazing of Al, properties of brazed joints in Cu, gas welding, arc welding, carbon-arc welding, inert-gas welding, spot welding, butt welding, pressure welding, and cold welding. (K general, K8, Cu, Al, ST)

4-K. Welding With Aluminum Bronzes. E. C. Mantle. *Engineering,* v. 172, Oct. 5, 1951, p. 443-444.

The Al bronzes are a potentially useful group of filler-rod materials for making high-strength welds in Cu-base alloys. Their mechanical strength is among the highest obtainable from Cu-base alloys and they have excellent resistance to corrosion under a wide range of conditions. The presence of a strong oxide film on the surface of the metal makes gas welding with these alloys difficult, but certain metallurgical factors are taken into consideration, the alloys are quite suitable for arc welding. Experimental work with the three main types. (K1, K2, Cu)

5-K. How New Process Bonds Aluminum and Alloys to Cast Iron, Steel and Stainless Steel. W. F. Palmer. *Industrial Gas,* v. 30, Nov. 1951, p. 5-7.

Process developed by Fairchild Engine & Airplane Corp. calls for ex-

treme uniformity and accuracy of temperature control.
(K12, Al, SS, ST, Fe)

6-K. Adhesive Bonding of Magnesium Assemblies. *Magazine of Magnesium,* Nov. 1951, p. 10-15.

Recommended equipment and procedures, using Consolidated Vultee's Metlbond process. (K12, Mg)

7-K. Welding Unstabilized Austenitic Stainless Steels Without Carbide Precipitation. J. A. Goodford and D. W. Kaufmann. *Materials & Methods,* v. 34, Nov. 1951, p. 64-65.

Rapid cooling of the heat-affected zone after welding reduces chances of subsequent intergranular corrosion. (K1, SS)

8-K. Methods of Minimizing Cracking at Temperatures Above the Solidus During the Fusion Welding of Aluminium Alloys by the Oxyacetylene and Argon-Arc Processes. D. C. Moore. *Sheet Metal Industries,* v. 28, Nov. 1951, p. 1025-1037, 1040.

The theoretical treatment of Pumphrey and Jennings has been utilized for the development of practical methods. Details of experiments. 18 ref. (K2, K1, Al)

9-K. An Unusual Louver Order; Fabricating and Assembling 12,000 Aluminum Louvers for 300 Ft. British "Skylon". *Sheet Metal Worker,* v. 43, Nov. 1951, p. 36-39, 82. (Condensed from *Sheet Metal Industries.)*

Shop methods for fabricating and assembling the many components for the huge Skylon. The 12,000 louvers were made in almost 500 different lengths, some varying only 0.010 in. 96,000 rivets were used with 24,000 rivet backing plates.
(K13, T26, Al, CN)

10-K. Huge Welders Handle Largest Aircraft Fuel Tanks. *Steel,* v. 129, Nov. 19, 1951, p. 95-96.

New resistance-welding machines, among the largest of their type in the country, installed at Ryan Aeronautical Co. to handle huge aircraft structures and jet-engine-exhaust components. (K3)

11-K. Production of Welded Gear Drives. *Welding and Metal Fabrication,* v. 19, Nov. 1951, p. 412-418.

Miscellaneous welding equipment and procedures of Falk Corp., Milwaukee. In general, only mild steel is fabricated. (K general, T7, CN)

12-K. Prefabricated Tugs Built in Finland. H. Branders. *Welding and Metal Fabrication,* v. 19, Nov. 1951, p. 421-423.

Welding equipment and procedures of Finnish shipyard.
(K general, T22, CN)

13-K. Resistance Welding Alloy Steels. R. Bushell. *Welding and Metal Fabrication,* v. 19, Nov. 1951, p. 424-426.

Various types of equipment and procedures. Recommendations.
(K3, AY)

14-K. Fabrication at the Davy, Paxman Works. *Welding and Metal Fabrication,* v. 19, Nov. 1951, p. 427-434.

Equipment and procedures for forming and welding of heavy equipment in various steels.
(K general, G general, ST)

15-K. The E. S. S. Welding Process. (Concluded.) H. O. Willrich. *Welding and Metal Fabrication,* v. 19, Nov. 1951, p. 435-437, 441.

A German arc-welding process.
(K1)

16-K. Welding Fixtures for Use With Submerged Arc. John Berkeley. *Welding Journal,* v. 30, Nov. 1951, p. 977-985.

Successful use of automatic welding requires efficient deposition of flux, disposal of the slag, recovery of unfused material, adequate backing, and suitable fixtures for the techniques employed. Types of machines used for circumferential and longitudinal seams. (K1)

17-K. The Inert-Arc Welding of Thin-Walled Tubing. R. S. Zeno and H. L. C. Leslie. *Welding Journal,* v. 30, Nov. 1951, p. 986-992.

Techniques for inert-arc welding of thin-walled tubing made of stainless steel, mild steel, nickel, titanium, molybdenum, and Fernico.
(K1, SS, CN, Ni, Ti, Mo, SG-n)

18-K. Pressure Welding. Part III. Hot-Pressure Welding. Frank S. Gardner. *Welding Journal,* v. 30, Nov. 1951, p. 995-1003.

Historical review of hot pressure welding, classification of welding processes, precautions, procedures, design, quality control and special applications to Al and its alloys. 14 ref. (K5, Al)

19-K. Resistance Variations During Spot Welding. W. L. Roberts. *Welding Journal,* v. 30, Nov. 1951, p. 1004-1019.

Resistance variations in the formation of spot welds in low-carbon steel, stainless steel, and aluminum 3S alloy including the electrical conduction of various contacts and methods for the measurement of resistance. (K3, CN, SS, Al)

20-K. Safe Practice in Oxyacetylene Welding and Cutting. Simon A. Greenberg. *Welding Journal,* v. 30, Nov. 1951, p. 1020-1025.

Safety in welding and cutting has been achieved through recognition of the hazards, and through the establishment of proper precautions to deal with them. (K2, G22, A7)

21-K. Good Welding Setups. James E. Dipert. *Welding Journal,* v. 30, Nov. 1951, p. 1026-1028.

Automatic and semi-automatic machines using submerged arcs do fast work besides insuring excellent joints. Some weldments displace

cast steel, yielding superior products at lower cost. (K1)

22-K. Seam Welding of Monel Metal. Ernest F. Nippes and Gerald M. Slaughter. *Welding Journal,* v. 30, Nov. 1951, p. 537s-544s.

Results of an investigation to determine the optimum conditions for seam welding of monel sheet 0.010-0.062 in. thick. Satisfactory seam welds require no porosity in the nugget, good penetration, sufficient overlap, and wide current range. (K3, Ni)

23-K. Nested Electrodes for Metal-Arc Welding. William A. Snyder. *Welding Journal,* v. 30, Nov. 1951, p. 557s-564s.

Electrode consists of two or more filler metal rods nested together but insulated from each other except at the end where they are gripped by the electrode holder; at this point they are connected to each other or to a common source of current. (K1)

24-K. The Welding of Heat Resistant Alloy Sheets. *Metal Progress,* v. 60, Nov. 1951, p. 118, 120, 122, 124, 126, 128. (Condensed from "Welding of Heat-Resistant Alloys in Sheet Form".) H. E. Lardge. *Iron and Steel Institute.*

Previously abstracted from "Symposium on High Temperature Steels and Alloys for Gas Turbines." See item 487-K, 1951. (K general, SS, AY)

25-K. Machine Seamwelds Front Fenders Faster. W. G. Patton. *Iron Age,* v. 168, Dec. 13, 1951, p. 134-135.

How Buick front fenders are being seam welded on an ingenious new machine which combines the advantages of a fender bender and seam welder. Production rate is 180 fenders per hr. Heating operation for forming around headlight area was eliminated. Savings in press time, handling and finishing were effected. (K3, G4, CN)

26-K. Welding Aluminum Is No Problem. *Industry & Welding,* v. 24, Dec. 1951, p. 31-32, 61.

Use of inert-gas shielded-arc welding in the fabrication of Al fuel tanks for jet planes. (K1, Al)

27-K. Fundamental Facts About Stud Welding. *Industry & Welding,* v. 24, Dec. 1951, p. 45-47.

Versatility of the process. (K1)

28-K. Re-Design for Welding at Baker Industrial Truck. *Industry & Welding,* v. 24, Dec. 1951, p. 48-49, 51-53.

Welded design gives 25% reduction in assembly time, 35% saving in weight. Fork-truck users get better equipment, improved operation, and easier maintenance. (K1, T21, ST)

29-K. How to Seal Glass to Metal in Mass Output. Bob G. Bender. *Ceramic Industry,* v. 57, Dec. 1951, p. 76-78, 113, 115.

Process for manufacturing glass-metal television picture bulbs. (K11, ST)

30-K. New Welded Full View Mast. J. B. McCormick. *Petroleum Engineer,* v. 23, Dec. 1951, p. B62, B65-66, B68, B70.

Combination of welded and bolted design has advantages of the standard drilling derrick as well as light portable rig. (K general, T28, ST)

31-K. Metal Bonding Makes Strong, Smooth Assemblies. Gerald Eldridge Stedman. *Steel,* v. 129, Dec. 17, 1951, p. 90-93.

Attachment of thin Mg skins to doublers and reinforcing members by an adhesive bonding process that avoids attachment blemish and gives a smooth exterior surface on locations like trailing edges in airplanes. It eliminates rivet patterns outside of attachment areas and provides excellent resistance to fatigue in areas subject to vibration. (K12, Mg)

32-K. Some Basic Ideas on Adhesion. N. A. de Bruyne. *Plastics,* v. 16, Nov. 1951, p. 308-309.

A survey. Ideas on how metals are glued are included. (K12)

33-K. Metal Stitching Speeds Assembly, Reduces Cost. Arthur G. Denne. *Tool Engineer,* v. 27, Dec. 1951, p. 50-52.

The stitch-forming mechanism of a metal stitcher. Strength of metal-stitched joints. Recommended thicknesses of materials for assembly by metal stitching. (K13)

34-K. Large Flat-Face Cathode-Ray Tubes for Radar. C. S. Szegho. *Tele-Tech,* v. 10, Dec. 1951, p. 52-53, 94.

Glass-to-metal sealing techniques developed for TV are now being applied to manufacture of tubes providing larger direct-view, radar displays. Flat faces permit plotting or superimposing information such as markers or maps. (K11, T1)

35-K. Saved Steel, Cut Costs. LaMotte Grover. *Welding Engineer,* v. 36, Dec. 1951, p. 25-27, 42-43.

Use of welded construction in New York City hospital-addition project. Material and money savings thus made possible. (K1, T26, ST)

36-K. Making "Bulldogs" at Cadillac. *Welding Engineer,* v. 36, Dec. 1951, p. 28-29.

Use of arc welding in construction of military tanks at Cleveland Tank Plant, Cadillac Motor Car Div., General Motors Corp. (K1, T2, CN)

37-K. "Tanks-a-Million". Clyde Smith. *Welding Engineer,* v. 36, Dec. 1951, p. 30-31.

Use of manual and automatic inert-arc welding processes, to help Beeson Tank Co. live up to the above slogan in the production of aluminum tanks. (K1, T26, Al)

38-K. Rail Welding and Reconditioning. Fred M. Burt. *Welding Engineer,* v. 36, Dec. 1951, p. 32-34.

Procedures and equipment of Southeast Custom Welding Co., Los Angeles, contract welder for Los Angeles Junction Railway. (K1, K2, CN)

39-K. Welding the Superalloys. John Starr. *Welding Engineer,* v. 36, Dec. 1951, p. 35-37, 54.

Various welding procedures and equipment used by Stainless Steel Products, Inc., Burbank, Calif., for joining miscellaneous ferrous and nonferrous alloys used in jet engines and other high-temperature applications. (K general, SG-h)

40-K. Automatic Equipment to Seam Weld Containers. C. S. Seltzer. *Welding Engineer,* v. 36, Dec. 1951, p. 38-42.

See abstract of "Seam Welding Containers Automatically," *Welding Journal,* item 563-K, 1951. (K3, CN)

41-K. Resistance Welding Saves Time and Money. Frank Charity. *Modern Machine Shop,* v. 24, Dec. 1951, p. 198-200, 202, 204, 206, 208, 210, 212.

Use of resistance welding in the assembly of airplane structural components. (K3, T24)

42-K. Automatic Riveting. Reed B. Scott. *Western Machinery and Steel World,* v. 42, Nov. 1951, p. 82-83.

Equipment and procedures of Lockheed Aircraft in fabrication of P2V patrol bomber wings. (K13, T24)

43-K. Cost Saving; Metal Stitching Speeds Aluminum Door Assembly. C. H. Taylor. *Western Machinery and Steel World,* v. 42, Nov. 1951, p. 94-95. (K13, Al)

44-K. The Physical and Metallurgical Characteristics of Spot-Welded Titanium. M. L. Begeman, F. W. McBee, Jr., and J. C. Fontana. *Engineers Digest,* v. 12, Nov. 1951, p. 363-364, 382.

See abstract from *Welding Journal,* item 573-K, 1951. (K3, Ti)

45-K. Recent Development in Ethoxyline Resins. Phil E. Preiswerk. *Light Metals,* v. 14, Nov. 1951, p. 594-597.

Emphasis on their use for joining metals to metals, ferrous to nonmetals, etc. (K12)

46-K. Processes Used in Bonding Metals. F. H. Parker. *Light Metals,* v. 14, Nov. 1951, p. 597-603.

Emphasis on the Redux process. Details of curing equipment, preparation for curing, the curing process, testing and inspection procedures, and advantages of metal-to-metal bonding. (K11)

47-K. Argon Arc Welds in an Al-Mg Alloy. T. Morgan. *Light Metals,* v. 14, Nov. 1951, p. 605-613.

Recommended procedures. Results of tensile strength and hardness determinations on the welds. (K1, Q27, Q29, Al)

48-K. Site-Work on Light-Alloy Mine Equipment. J. C. Bailey. *Light Metals,* v. 14, Nov. 1951, p. 615-616.

Discusses previous article entitled "Duralumin Mine Skips and Cages". Methods for repair and riveting. (K13, T28, Al)

49-K. Welded Aluminum Piping. D. R. Cheney. *Metal Industry,* v. 79, Nov. 23, 1951, p. 441-445.

Equipment and materials required, the effect of welding on the properties of the piping, welding techniques, and suitable applications. (K general, Al)

50-K. The Bonding of Metals. C. J. Moss. *Journal of the Birmingham Metallurgical Society,* v. 31, Sept. 1951, p. 149-161.

Reviews use of synthetic-resin adhesives for the above. 11 ref. See abstracts from *Metal Progress,* item 587-K, 1951. (K11)

51-K. The Welding of Copper Pressure Vessels by Means of the Oxygen-Acetylene Process. F. T. Galton. *Australasian Engineer,* Oct. 8, 1951, p. 70-73.

Established practices and further research. The requirements of welding Cu. A large project for welded Cu pressure vessels. (K2, Cu)

52-K. Resistance Welding and Its Application Technique. (In French.) Mario Sciaky. *Revue de la Soudure; Lastijdscrift,* v. 7, No. 3, 1951, p. 147-166.

Results of an investigation of various types of apparatus. Various machines and their modes of operation. Choice is determined by economic factors rather than by technical ones. (K3)

53-K. Arc Welding in an Atmosphere of Argon. (In French.) A. Moreau. *Revue de la Soudure; Lastijdschrift,* v. 7, No. 3, 1951, p. 163-177.

Principles and technology of the process. Various types of apparatus for the purpose and their mode of operation. Application of this type of welding to different metals; also spot welding and welding with a consumable electrode in an atmosphere of argon. (K1)

54-K. High-Frequency Apparatus for Starting and Maintaining an Arc. (In French.) M. Moneyron. *Soudure et Techniques connexes,* v. 5, Sept.-Oct. 1951, p. 217-220; disc., p. 220-221.

The permanent pilot spark connected to welding apparatus is often the cause of radio interference. An improved method to lessen these disturbances. (K1)

55-K. Procedures for Carrying Out Expanded Right-Hand Welding. (In German.) W. Hofmann, H. v. Hofe, and W. Newiger. *Schweissen und Schneiden,* v. 3, Oct. 1951, p. 297-304.

Method eliminates inherent tensions in steel welds by flame after-treatment of the weld. 13 ref. (K2, J2, ST)

56-K. How to Discover New Welding Processes by Systematizing the Field. (In German.) H. v. Neuenkirchen. *Scheweissen und Schneiden,* v. 3, Oct. 1951, p. 311-314.

Systematically arranges the vari-

ous welding processes. Gaps in the tables show new possibilities for combinations to be investigated. (K general)

57-K. "EHV" Welding. (In German.) Richard Marek. *Schweisstechnik,* v. 5, Sept. 1951, p. 97-102.

Welding method for steel in which the electrode is coated, preferably with copper, in order to avoid undesirable phenomena otherwise incurred in arc welding. "EHV" is an abbreviation for "Elin-Hafergut". (K1, ST)

58-K. Quality Problems in the Submerged-Arc Welding Process. (In German.) Max Komers. *Stahl und Eisen,* v. 71, Nov. 8, 1951, p. 1225-1232.

Development, applications, and advantages of the process as compared with other welding methods for steel. Types of welding fluxes, their compositions, and efficiencies; Mn losses with different powder types; structure and joint shape in 2-layer and multiple-layer welding. Notched-bar impact strength, ultimate strength, and structure of the welds after different heat treatments. Effects of P and S segregations on crack development in the welds, also nondestructive testing of the welds. (K1, K9, ST)

59-K. Experimental Determination of the Distribution of the Strains in the Joints of Single-Line Rivets Subject to Static Stressing. (In Italian.) E. von Burg. *Alluminio,* v. 20, Sept. 1951, p. 341-350.

Distribution of strains, both in the rivets and the sections of the joint, were investigated for several Al-alloy rivet compositions. (K13, Q25, Al)

60-K. Study of Shrinkage Fitting. (In Portuguese.) Ferrucio Fabriani. *Boletim da Associacao Brasileira de Metais,* v. 7, July 1951, p. 321-345.

Theoretical review. Distinguishes between force fit, shrink fit, and freeze fit. Attempts to systematize the entire problem. (K13)

L

CLEANING, COATING AND FINISHING

1-L. Ceramic-Coated Exhaust-Systems. Wilson G. Hubbell. *Aircraft Production,* v. 13, Nov. 1951, p. 357-362.

See abstract of "Ceramic Coatings for the Hot Spots," *Finish,* item 781-L, 1951. (L27)

2-L. How to Clean Stainless Steel. *American Machinist,* v. 95, Nov. 12, 1951, p. 173.

Recommended mechanical and chemical procedures. (L10, L12, SS)

3-L. Symposium on Conservation of Pickle Room Materials. Lewis C. Farrow, J. J. Baker, and M. H. Whitehead. *Better Enameling,* v. 22, Nov. 1951, p. 6-10.

Introduction and summary of panel discussion is by Mr. Farrow. Separate statements by Mr. Baker and Mr. Whitehead. (L12)

4-L. Government Specifications for Porcelain Enamels. W. N. Harrison. *Better Enameling,* v. 22, Nov. 1951, p. 32-36.

(L27, S22)

5-L. Enameling of Aluminum. C. R. Sigler. *Better Enameling,* v. 22, Nov. 1951, p. 11-12, 22-23, 29-30.

Previously abstracted from *Ceramic Age.* See item 772-L, 1951. (L27, Al)

6-L. Conservation of Zinc; Economies in Hot-Dip Galvanizing. *Chemical Age,* v. 65, Nov. 3, 1951, p. 599-602.

Surveys work done by British Non-Ferrous Metals Research Assn. (L16, Zn)

7-L. The Polishing of Silverware & Jewelry. G. E. Gardam. *Electroplating and Metal Finishing*, v. 4, Oct. 1951, p. 303-305, 312.

Mechanical finishing procedures. (L10, EG-c, Ag)

8-L. The Early Development of Metal Spraying. C. R. Draper. *Electroplating and Metal Finishing*, v. 4, Oct. 1951, p. 329-330, 333.

History, present status, and future prospects. (L23)

9-L. Metallizing Glass. Elmar Umblia. *Glass*, v. 28, Oct. 1951, p. 343-351. (Translated from *Glasteknish Tidskrift*, v. 5, No. 6, 1950.)

Procedures and applications. Characteristics of the different metals used in the process. 19 ref. (L23, T)

10-L. Ceramic Coatings Can Save Critical Alloys. W. G. Hubbell. *Iron Age*, v. 168, Nov. 22, 1951, p. 81-85.

See abstract of "Ceramic Coatings for the Hot Spots", *Finish*, item 781-L, 1951. (L27)

11-L. Mechanism and Kinetics of the Chromizing of Mild Steel in Atmospheres Containing Chromous Chloride. T. P. Hoar and E. A. G. Croom. *Journal of the Iron and Steel Institute*, v. 169, Oct. 1951, p. 101-107.

Shows experimentally that 0.1% C mild steel exposed to atmospheres containing chromous chloride at 950-1100° C. becomes coated with a Cr-rich layer. The over-all rate of chromizing is limited, in the early stages, by the rates of the reactions; and, in the later stages, by the rate of metallic interdiffusion in the growing alloy layer. Various practical chromizing processes are discussed in the light of the experimental results. 17 ref. (L15, CN)

12-L. Subsidiary Paint Tests at Birmingham: Final Report. J. C. Hudson. *Journal of the Iron and Steel Institute*, v. 169, Oct. 1951, p. 153-156.

An exposure test over 15 years, confirmed that surface preparation is the most important single factor contributing to successful protection of iron and steel, by means of paint, against atmospheric corrosion. The average life of two-coat painting schemes was nearly six times greater on a pickled surface than on a weathered and wirebrushed surface. The best of the painting schemes tested—two coats of micaceous iron ore paint—protected pickled wrought iron perfectly. Even better results should be obtained by using a red-lead priming paint under a finishing coat of micaceous iron ore paint. Heating to dehydrate the rust improved the performance of painting schemes. (L26, Fe, ST)

13-L. De-Enameling Process Economically Reclaims Defective Enameled Ware. Kenneth Rose. *Materials & Methods*, v. 34, Nov. 1951, p. 80-81.

By stripping off imperfect vitreous finishes in a strong alkali bath, shaped iron and steel pieces can be salvaged for refinishing with consequent savings in cost and scrap. (L12, A8, CI, ST)

14-L. Primers for Ferrous Metals. T. A. Dembski, R. Marotta, F. W. Alvarez, E Berberina, S. Fine, R. L. Jeffrey, H. Jerome, H. Kelfer, B. J. Mayo, F. S. McIllwaine, W. B. Pierce, S. White, B. Wilson, and E. Zarach. *Paint, Oil & Chemical Review*, v. 114, Nov. 8, 1951, p. 116-118.

Previously abstracted from "A Study of Primers for Ferrous Metals in an Atmospheric Exposure", *American Paint Journal* (Convention Daily). See item 770-L, 1951. (L26, ST)

15-L. Finishing Procedures at Erie Art Metal. Walter Rudolph. *Products Finishing*, v. 16, Nov. 1951, p. 12-16, 18.

Various procedures such as degreasing, polishing, and painting. Diversified metal baskets, cabinets, boxes, panels, etc., are produced. (L general)

16-L. Pickling and Electroplating Beryllium-Copper Alloy Components. *Product Finishing*, v. 16, Nov. 1951, p. 22-24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48.

A study of the corrodibility of the Be-Cu alloys was made. Heat treatment and surface conditions in preparation for pickling and electroplating. (L12, L17, R general Cu)

17-L. Cleaning With Sound Waves. John Starr. *Products Finishing*, v. 16, Nov. 1951, p. 52-54, 56, 58.

Magnetostrictive and electrostrictive generators. Factors to be considered in the selection of cleaning solutions. 13 ref. (L12)

18-L. Basic Research and Test Methods Applied to Organic Finishes. Allen G. Gray. *Products Finishing*, v. 16, Nov. 1951, p. 60, 62, 66, 68, 70, 72, 74, 76, 78, 80, 82, 84, 86.

Reviews several recent papers including some presented at Second Symposium on Varnish and Paint Chemistry. Various test methods of evaluating properties of films. (L26)

19-L. Highlights of the American Electroplaters' Society's Research Program. Donald Price. *Products Finishing*, v. 16, Nov. 1951, p. 88, 90, 92, 94, 96, 98.

A brief summary of various projects. (L17, A9)

20-L. Ceramic Coatings for Metal Protection at High Temperatures. *Product Engineering*, v. 22, Nov. 1951, p. 177-179.

Life of components made from austenitic stainless steels, Inconel, and other high-temperature alloys can be extended as much as 100% by use of sprayed or dipped ceramic coatings. The South Wind Div. of Stewart Warner Corp. anticipates wide use in production operations. (L27, SG-h)

21-L. Selection of Corrosion-Resistant Materials for Waste Treatment Plants. Walter J. Sandel. *Sewage and Industrial Wastes*, v. 23, Nov. 1951, p. 1448-1454.

Main emphasis on protective coatings. (L general, A8)

22-L. A Student's Approach to the Theory and Practice of Vitreous Enamelling. (Continued.) J. H. Gray. *Sheet Metal Industries*, v. 28, Nov. 1951, p. 1043-1050.

Sheet-iron cover coating, brushing and transferring, production of castings for vitreous enameling, preparation of surfaces for enameling, and processing of castings after shot-blasting. (L26, ST)

23-L. Testing Organic Finishes. *Steel*, v. 129, Nov. 26, 1951, p. 86-90, 92.

Interprets tests and finish requirements in terms of finish selection, surface preparation, and application methods. 11 ref. (L26)

24-L. The Theory and Practice of Hot-Dip Tinning; Application to Wire Processing. W. E. Hoare. *Wire Industry*, v. 18, Oct. 1951, p. 867-870, 873-875; Nov. 1951, p. 969-971.

Covers tinning of copper as well as iron and steel. (L16, Sn, Cu, ST)

25-L. Durable Enamel Finishes on Zinc-Base Die-Castings. E. E. Halls. *Metallurgia*, v. 44, Oct. 1951, p. 174-178.

Properties of enamelled finishes, paying particular attention to pretreatment. (L26, Zn)

26-L. Dragout Control. Part II. Joseph B. Kushner. *Metal Finishing*, v. 49, Dec. 1951, p. 58-61, 67.

Continues a previous discussion on physical properties of plating solutions. Geometry of the object to be plated. (To be continued.) (L17)

27-L. Electrodeposition of Nickel in the Bores of Tubes Using Insoluble Anodes. A. W. Hothersall and G. E. Gardam. *Metal Finishing*, v. 49, Dec. 1951, p. 65, 69. (A condensation)

Smooth deposits of Ni having good mechanical properties may be built up to a considerable thickness on the bores of tubes by the use of an insoluble anode which is made of or coated with lead. Details of recommended procedures. (L17, Ni, ST)

28-L. Electrodeposition on Aluminium; A Study of the Zincate Process. G. L. J. Bailey. *Metal Finishing*, v. 49, Dec. 1951, p. 66-67.

Influence of alloy composition and conditions of heat treatment upon adhesion. A theory of the mechanism of adhesion for the zincate process. (L17, Al, Zn)

29-L. Silver Plating With Insoluble Anodes. Walter R. Binai. *Metal Finishing*, v. 49, Dec. 1951, p. 68-69.

Advantages of plating with insoluble anodes. (L17, Ag)

30-L. Calculating Metal Cost for Rhodium Plating. *Metal Finishing*, v. 49, Dec. 1951, p. 79.

A chart. (L17, Rh)

31-L. Selecting Organic Coatings for Metal Products. *Product Engineering*, v. 22, Dec. 1951, p. 173-180.

Types of organic coatings and their principal uses. (L26)

32-L. Iron Plating Cheats the Scrap Pile. *Business Week*, Dec. 1, 1951, p. 108-110.

A new method of plating pure iron to any desired thickness on steel is called "Vanderloy M". The process replaces worn-off metal. (L17, Fe, ST)

33-L. Magnetic Device Improves Continuity of Pickling Line Operations. W. W. Palmer. *Steel*, v. 129, Dec. 3, 1951, p. 96, 98, 100, 102, 105, 108.

Magnetic loop control which allows strip to be run closer to bottom of tank, affords longer path through acid, and permits increased strip speeds. Cleaning line equipped with new control increased output from 400 to 580 tons per turn. (L12, S18)

34-L. Measuring Adhesion of Organic Coatings. Fred M. Burt. *Organic Finishing*, v. 12, Nov. 1951, p. 14-15.

The Adherometer, developed in the research laboratories of the Interchemical Corp., is designed to measure the stripping force required to remove a paint film from the surface of a metal test panel. (L12)

35-L. Liquid Stainless Steel. A. L. Phillips. *Organic Finishing*, v. 12, Nov. 1951, p. 16-18.

Stainless steel is reduced by a new process to a microscopically fine form and combined with vinyl plastic to form a quick-drying liquid that will give a protective coating of actual stainless steel. Applications. (L22, SS)

36-L. Flow Coating Helps Speed Production at Bendix. Virgil C. Rice. *Finish*, v. 8, Dec. 1951, p. 22-23.

A six-stage cleaning and phosphatizing unit for Bendix parts. Also a flow-coating unit. (L12, L26)

37-L. The Technical Details of Low Pressure Spraying. Roy D. Beck. *Finish*, v. 8, Dec. 1951, p. 25-28, 65-66.

Type of porcelain enamel to be used, product and its design, supervision and personnel, equipment, process technique, production and advantages, and conclusions. (L27)

38-L. Lead: Cladding Adds New Uses. *Iron Age*, v. 168, Dec. 6, 1951, p. 114.

A new process of lead cladding copper and steel. Uses whenever H_2SO_4 creates a corrosion problem. (L22, R5, Cu, ST)

39-L. Electroforming Solves Special Production Problems. John Kolb *Iron Age*, v. 168, Dec. 6, 1951, p. 151-153.

Electroforming to overcome such difficulties as extra-sharp corners and points, intricate contours, and especially tight tolerances. The process is equally adaptable to experimental or large-scale production, it can be used to turn out, first, ex-

perimental pieces and, later, production parts. Emphasis is on Cu and Ni. (L18, Cu, Ni)

40-L. Cleaning Metal Parts With Red Garnet Sand. Ira S. Roberts. *Modern Machine Shop*, v. 24, Dec. 1951, p. 214, 216.

Merits of red garnet sand are compared with silica sand. (L10)

41-L. Solution Control in the Electroplating Trade. K. E. Langford. *Electroplating and Metal Finishing*, v. 4, Nov. 1951, p. 338-339. (Excerpts from "Analysis of Electroplating and Related Solutions," to be published in book form.)

Theory and limitations of both fluorides and silico-fluorides in barrel Cr plating solutions. Mentions an electrochemical method for the determination of sulfate in Cr plating solutions. (L17, Cr)

42-L. Rochelle Copper Plating With Air Agitation. Bernard C. Lewsey. *Electroplating and Metal Finishing*, v. 4, Nov. 1951, p. 341-343.

A Rochelle Copper plating technique developed for obtaining dense lustrous deposits on the wide variety of work which the jobbing plater is called upon to undertake. Vigorous air agitation is essential and does not cause excessive carbonation. (L17, Cu)

43-L. The Complementary Processes of Metal Spraying and Painting. W. P. Jenkins and J. A. Willey. *Electroplating and Metal Finishing*, v. 4, Nov. 1951, p. 365-366.

Protection of ferrous metals by a Zn coating followed by painting. (L23, L26, Fe, Zn)

44-L. Metal Plating on Plastics. *Bakelite Review*, v. 23, Oct. 1951, p. 10-11.

A new and economical method of plating metal on phenolic, styrene and vinyl plastics which makes possible lightweight, corrosion resistant products with hard, high-polish metal surfaces. (L17)

45-L. Overhead Oven Speeds Finishing and Reduces Costs at Atlas Mfg. Company. *Industrial Heating*, v. 18, Nov. 1951, p. 2055-2056, 2058, 2060, 2062.

Conveyerized finishing system for furnace casings and boiler jackets. The ovens are gas-fired. (L26)

46-L. Abrasive Liquid Blasting. N. I. Gorayetski. *Engineers' Digest*, v. 12, Nov. 1951, p. 365-368. (Translated from *Stanki i Instrument*, v. 22, No. 7, 1951, p. 27-31.)

Experimental work on metal removal by blasting with an abrasive liquid and equipment for directing the abrasive jet onto the treated surface. Influence of individual factors on this process. (L10)

47-L. The Role of Carbon in the Formation of Thin Film Deposits. O. Goche, F. Boullon, and A. Frére. *Engineers' Digest*, v. 12, Nov. 1951, p. 375-377. (Translated from *Bulletin de la Classe des Sciences, Academie royale de Belgique*, ser. 5, v. 36, 1950, p. 330-339.)

A study to determine the general validity of the corresponding mechanism for other elements or compounds. Experiments and results obtained on cathodic atomization of Ag, Cu, and Zn. (L25, Ag, Cu, Zn)

48-L. High Pressure Setup Cleans Gear Housings. Herbert Chase. *Steel*, v. 129, Dec. 10, 1951, p. 95-96.

A conveyorized automatic washer, that replaces old hand-brushing, low-pressure spray and blowing-out arrangement. Air hammers help loosen particles that might otherwise cling to interior surfaces. (L10)

49-L. Research on Electrodeposition at the National Bureau of Standards. William Blum. *Technical News Bulletin* (National Bureau of Standards), v. 35, Dec. 1951, p. 180-185.

Developments in chromium plating and nickel deposition. Studies on the principles of electrodeposition. Future work in this field. (L17, Cr, Ni)

50-L. Pure-Iron-Plating Process. *American Machinist*, v. 95, Dec. 10, 1951, p. 197.

Advantages and applications of the Vanderloy-M plating process developed by Van der Horst Corp. Renews cylinders liners, crankshafts, etc. (L17, Fe, ST)

51-L. Production Experience Proves Diaphragm Plating. R. L. Redmond. *Iron Age*, v. 168, Dec. 13, 1951, p. 132-133.

By directing plating solution flow from the cathode through a fabric diaphragm to the work being plated, surface pits, bumps, and polarization are minimized. Also, experiences show that circulation of solution and filtration are improved. (L17)

52-L. Fishscale Susceptibility of Enamel-Steel Systems. Donald C. Bowman. *Ceramic Industry*, v. 57, Dec. 1951, p. 70-73, 116.

Preliminary investigation of a method of accelerating the formation of fishscale to study the defect in porcelain-enameled steel. Ways in which the defect can be minimized or avoided. Photomicrographs of enamel-steel interface. (L27, CN)

53-L. Electroplating of Gold Alloys. Edward A. Parker. *Plating*, v. 38, Nov. 1951, p. 1134-1140, 1156; Dec. 1951, p. 1256-1259.

Use in jewelry and decorative plating. Physical factors which affect color and composition of Au alloy plates are agitation, current density, temperature, concentration, free cyanide, pH, other salts, aging, impurities, surface finish, and anodes. Second installment: Au alloy solutions from the viewpoint of color. (To be continued) (L17, Au)

54-L. Barrel Finishing. I. Some Fundamentals. Morris S. Shipley. *Plating*, v. 38, Dec. 1951, p. 1240-1242, 1260-1261.

The variables to be considered. Applications. (L10)

55-L. Cleaning and Preparation of Metals for Electroplating. IV. Degreasing Evaluation Test: Sequential Testing. Henry B. Linford and Edw. B. Saubestre. *Plating*, v. 38, Dec. 1951, p. 1263-1266.

A number of degreasing-evaluation tests were studied, along with the newly developed atomizer test. The atomizer test was found to be the most sensitive, followed by the fluorescent-dye test. The spray-pattern, potassium ferricyanide paper, and copper sulfate dip tests were found considerably less sensitive. (To be continued.) (L12)

56-L. Nickel Plating With Insoluble Anodes. W. A. Wesley, D. S. Carr, and E. J. Roehl. *Plating*, v. 38, Dec. 1951, p. 1243-1250; disc., p. 1250, 1255.

Describes an electrolytic replenishing method devised for maintaining the Ni content and pH of a chloride-free Ni plating bath which is concurrently being depleted by Ni plating with insoluble anodes. A disadvantage of this process is that gases are copiously liberated at the various electrodes and cause considerable spray. 10 ref. (L17, Ni)

57-L. Differential Coating Process Saves Tin. J. J. Munns. *Steel*, v. 129, Dec. 17, 1951, p. 102, 104.

Different weight of coating on each side of sheet provides stock for containers with inside surface capable of resisting attack of product and outside surface capable of withstanding atmospheric conditions. (L17, Sn, ST)

58-L. Electrodeposited Tin-Nickel Alloy Coatings. N. Parkinson, S. C. Britton, and R. M. Angles. *Tin Research Institute*, 1951, 12 pages.

Previously abstracted from *Sheet Metal Industries*. See item 618-L, 1951. (L17, R1, R2, Sn, Ni)

59-L. The Abrasion Resistance of Sulphuric Acid Anodic Films on Aluminum and Its Alloys. R. C. Spooner. *Canadian Journal of Technology*, v. 29, Nov. 1951, p. 479-491.

The abrasion value of anodic coatings produced on Al alloys. Effect on the abrasion value of five process variables; anodizing time, sealing time, air aging, current density, and electrolyte temperature, was determined. 13 ref. (L19, Q9, Al)

60-L. Surface Finish. R. E. Reason. *Australasian Engineer*, Oct. 8, 1951, p. 43-59; disc., p. 59-64.

Various methods of measuring surface finish and various instruments used for the purpose. Numerical assessment of the surface. Ease and accuracy of instrumentation for each method. 15 ref. (L15)

61-L. The Silvering of Plastics. Dougal McPherson. *British Plastics*, v. 24, Nov. 1951, p. 383-384.

Emphasis on a new British patented process for electrodeposition of silver on plastic objects. (L17, Ag)

62-L. The Protection of Metallic Surfaces by Chromium Diffusion. Part IV. Modern Chromizing Methods. R. L. Samuel and N. A. Lockington. *Metal Treatment and Drop Forging*, v. 18, Nov. 1951, p. 495-502, 506.

Details of chromizing methods developed since 1938. The D.A.L. and B.D.S. processes, which employ pack-chromizing techniques, have proved to be the most practicable and are in commercial use today. (To be continued.) (L15, Cr)

63-L. The Production of Relief Designs on Aluminium Surfaces by Anodic Oxidation. G. O. Taylor. *Metallurgia*, v. 44, Oct. 1951, p. 243-244.

Method is based on the intensely hard anodic film produced by anodizing in H_2SO_4 under suitable conditions. The process is capable of a number of variations whereby an interesting range of decorative finishes is possible. (L19, Al)

64-L. Electrolytic Polishing and Anodic Oxidation of Aluminum; Their Study by Electron Diffraction. (In French.) M. Halfawy. *Revue de Métallurgie*, v. 48, Oct. 1951, p. 787-792.

Some results of experiments. 15 ref. (L13, L19, M21, Al)

65-L. Cleaning of Stainless Steel. (In French.) G. Rossi-Landi. *Métallurgie et la construction mécanique*, v. 83, Oct. 1951, p. 763, 765.

Use of various chemical procedures. (L12, SS)

66-L. Anodic Coloration of Light-Alloy Watch Rims. (In French.) Alexandre Mikailoff. *Revue de l'Aluminium*, v. 28, Oct. 1951, p. 372. (Reprinted from *Suisse Horlogére.*)

Process and properties of the product. (L19, Al)

67-L. Observations Relative to the Metallization of Surfaces by Evaporation in a Vacuum. (In French.) Louis Dunoyer. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 233, Oct. 22, 1951, p. 919-921.

Treatment of the surface in the vacuum before metallization; choice of metal constituting the heating device; treatment which makes it possible to increase considerably the hardness of the deposited metallic layer. (L25)

68-L. Operation and Results Obtained With a Machine for Descaling Wire. (In German.) Walter Zwierz. *Stahl und Eisen*, v. 71, Oct. 25, 1951, p. 1133-1135; disc., p. 1135-1137.

Development and operation of the "Gorcy" machine for mechanical descaling of steel wire. (L10, ST)

69-L. Improving Efficiency in Bright-Drawn Steel-Bar Pickling Plants. (In German.) Friedrich von der Heide. *Stahl und Eisen*, v. 71, Oct. 25, 1951, p. 1148-1154; disc., p. 1154-1155.

Pickling processes and reactions. Possibilities of conservation of acids,

pickling time, and materials. Effects of acid concentration, temperature, and nature of scale on pickling time for various steels. (L12, ST)

70-L. "Interior Surfaces" in Hot Galvanizing. (In German.) H. Bablik. *Metall*, v. 5, Nov. 1951, p. 479-480.

Summarizes papers published by author and associates concerning "inner surfaces" which are created during hot galvanizing. Proposes general law for the creation and consequences of enlarged surface areas or pores. (L16, Zn, ST)

71-L. Preliminary Cleaning—A Problem in the Metallurgical Industries. (In Portuguese.) Alberto Paulo Ribbe. *Boletim da Associacao Brasileira de Metais*, v. 7, July 1951, p. 366-377.

Various surface cleaning methods and their applicabilities to different problems. (L12)

72-L. (Book) **Paint Film Defects. Their Causes and Cure.** Ed. 3. Manfred Hess. 544 pages. 1951. Reinhold Publishing Corp., 330 West 42nd St., New York 18, N. Y.

Reference book of causes and remedies for paint failures. Various materials, their application and storage. The defects are arranged in accordance with a logical classification system and are discussed in turn. Includes coatings on both metals and nonmetals. Numerous footnote references, and bibliography. (L26)

73-L. (Book) **Electro-Plating. A Survey of Modern Practice.** Ed. 6. Samuel Field and A. Dudley Weill. 546 pages. Pitman Publishing Corp., 2 W. 45th St., New York 19, N. Y. $6.00.

Designed primarily for the working plater. Explains in considerable detail the fundamental principles of chemistry, electricity, and electrochemistry. Various types of equipment, and complete information on the deposition of both common and unusual metals. (L17)

74-L. (Book) **Electroplating and the Engineer.** Alan Whittaker. 87 pages. Emmott & Co., Ltd., 31 King St., West, Manchester 3, England. (Mechanical World Monograph 64.) 4 s.

Does not attempt to teach the practice of plating, but rather to introduce the engineer to the process. Equipment; type of material in relation to its suitability for plating; various methods of cleaning and surface treating. Each type of plating is considered in detail. Special chapters are devoted to Cr and alloy plating, and to electrolytic finishing and polishing. (L17)

M

METALLOGRAPHY, CONSTITUTION AND PRIMARY STRUCTURES

1-M. High-Temperature Thermal Analysis Using the Tungsten/Molybdenum Thermocouple. H. T. Greenaway, S. T. M. Johnstone, and Marion K. McQuillan. *Journal of the Institute of Metals*, v. 80, Nov. 1951, p. 109-114.

Technique which makes it possible to conduct thermal analyses at temperatures up to 2000° C. High-frequency induction heating is used, and the temperature is measured by means of a W-Mo thermocouple, for which a calibration curve is given. The method has been applied to the determination of the freezing point of pure Cr, which is shown to be 1845° ± 10° C., and the liquidus curve for the solid solution of Mn in Cr.
(M23, S16, Mn, Cr, W, Mo, SG-a)

2-M. The Alloys of Molybdenum and Tantalum. G. A. Geach and D. Summers-Smith. *Journal of the Institute of Metals*, v. 80, Nov. 1951, p. 143-146.

Investigation of the system Mo-Ta showed that these metals form a continuous series of solid solutions. No superlattice was detected and no anomalies occur between true and X-ray densities. Approximate melting points of the alloys were also determined. Alloys of the transition metals of Groups IVA, VA, and VIA with each other are discussed briefly. 16 ref. (M24, Mo, Ta)

3-M. Structure of Amorphous Aluminium Oxide Films. *Nature*, Oct. 6, 1951, p. 600-601.

Results of investigation. Refers to the oxide layer formed on Al by atmospheric oxidation.
(M27, R2, Al)

4-M. Statistical Theory of Properties of Solid Solutions. R. Smoluchowski. *Physical Review*, ser. 2, v. 84, Nov. 1, 1951, p. 511-518.

Properties of binary solid solutions are considered from the point of view of the fluctuation of local composition in the crystalline lattice. These variations influence the properties of the alloys by varying the corresponding local concentration of electrons. A simple general statistical method for calculating properties of random and ordered solid solutions. The theory is applied to saturation magnetization, temperature coefficient of electrical resistivity, thermo-electric power, and other properties of various alloys. 20 ref. (M26, P general)

5-M. Metallography of Alloys of Titanium With Oxygen, Carbon and Nitrogen. Thomas Redden and Mary Jane Field. *Steel*, v. 129, Nov. 19, 1951, p. 88-90.

Results of tensile strength, elongation, and hardness tests; also results of microstructural examination. (M27, Q27, Q29, Ti)

6-M. The Atomic and Electronic Structure of Metals. R. B. Bentley. *Metallurgia*, v. 44, Oct. 1951, p. 191-192.

Condensed from a lecture. (M25)

7-M. Applications of Electronic and Atomic Theories to the Structure and Properties of Alloys. E. W. Fell. *Metallurgia*, v. 44, Oct. 1951, p. 192-194.

The Hume-Rothery Rule; the electronegative valency effect; the relative valency effect; form and position of phase boundaries; superlattices. 5 ref. (M26, N10, P13)

8-M. Crystallographic Angles for Tin. J. F. Nicholas. *Journal of Metals*, v. 3, Dec. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 191, 1951, p. 1142.

Results of precise calculations.
(M26, Sn)

9-M. Constitution of Titanium-Aluminum Alloys. H. R. Ogden, D. J. Maykuth, W. L. Finlay, and R. I. Jaffee. *Journal of Metals*, v. 3, Dec. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 191, 1951, p. 1150-1155.

Al was found to be soluble in α-Ti to about 26% and to raise the temperature range of transformation from α to β. Two intermediate phases exist in the system, a new face-centered tetrogonal phase, designated as γ, which occurs between 34 and 46% Al, and $TiAl_3$. Metallographic and X-ray diffraction data were used to determine the diagram.
(M24, Ti, Al)

10-M. Useful Etchants for Electron Metallography. William L. Grube. *Journal of Metals*, v. 3, Dec. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 191, 1951, p. 1171-1173.

Relative merits of various types. Comparative photomicrographs at 5000x show results obtained with different etchants on different phases of steel and on cemented carbides and Vitallium.
(M21, ST, Co, C-n)

11-M. Analytical Representation of Certain Phase Boundaries. W. Rostoker. *Journal of Metals*, v. 3, Dec. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 191, 1951, p. 1203-1205.

Using an expression for the free energy of a homogeneous phase as a function of composition, a relationship is derived which interrelates the phase boundaries extending from the allotropic transformation of the solvent metal. Observed and calculated phase boundaries in the system Fe-Ni, Fe-Mn, Fe-Mo, and Ti-Cb are compared.
(M24, P12, Fe, Ni, Mn, W, Mo, Ti, Cb)

12-M. Uranium Sesquicarbide. M. W. Mallet, A. F. Gerds, and D. A. Vaughan. *Journal of the Electrochemical Society*, v. 98, Dec. 1951, p. 505-509.

Preparation and properties. It was found that U_2C_3 can be formed from a mixture of UC and UC_2. Crystal structure was found to be body-centered cubic. Micrographs.
(M26, C-n)

13-M. Photomicrography in Colour by Reflected Light With Special Reference to Metals. K. J. B. Wolfe. *Photographic Journal*, v. 91B, Sept.-Oct. 1951, p. 94-98.

Normal methods used for the preparation of metallic specimens for micro-examination and salient features of the metallurgical microscope or metallograph. The application of plane polarized light for the identification of nonmetallic inclusions. Methods using the Vickers projection microscope, for the production of transparencies of Kodachrome and Dufaycolor. Methods used for making paper prints by the Autotype "Trichrome Carbro" and the Kodak "Dye Transfer" processes. An alternative method available in the U. S. 16 ref. (M21)

14-M. A Simple Reflecting Microscope for High-Temperature Metallography. D. W. Dewhirst and M. J. Olney. *Journal of the Iron and Steel Institute*, v. 169, Nov. 1951, p. 221-227.

Design, construction, and adjustment of a simple reflecting microscope with a bispherical monocentric objective of 0.5 N.A. and 17 mm. working distance, with information on photographic techniques. A complete apparatus for the examination of specimens in vacuo at temperatures up to 1000° C., and some typical results obtained by its use. 37 ref. (M21)

15-M. Summarized Proceedings of Conference on Metals, Leamington Spa, April, 1951. *British Journal of Applied Physics*, v. 2, Nov. 1951, p. 305-318.

A summary of 18 papers on the texture and structure of metals presented at a conference of the Institute of Physics. 95 ref. (M26, M27)

16-M. The Diffraction Pattern of Cold Worked Metals: I. The Nature of Extinction. II. Changes in Integrated Intensity. W. H. Hall and G. K. Williamson. *Proceedings of the Physical Society*, v. 64, sec. B, Nov. 1, 1951, p. 937-953.

Part I: Experimental results for chemically produced Cu and annealed Al filings were obtained with a Geiger-counter spectrometer using monochromatic radiation. Evidence shows that annealed metals contain residual lattice strain, in accord with dislocation theory. Part II: Measurements were made, using a Geiger-counter spectrometer, of the changes produced by cold work on the integrated intensities in the Debye-Scherrer spectrum of Al. 33 ref. (M22, Cu, Al)

17-M. Outer Brillouin Zones for Face-Centred and Body-Centred Cubic Lattices. J. F. Nicholas. *Proceedings of the Physical Society,* v. 64, sec. B, Nov. 1, 1951, p. 953-956.

In order to resolve some inconsistencies in the literature on the 2nd Brillouin zones of cubic lattices, the shapes of these zones were recalculated. Results, together with descriptions of the 3rd and 4th zones. (M26)

18-M. Structure of $Cu_{32}Al_{19}$. A. J. Bradley. *Nature,* v. 168, Oct. 13, 1951, p. 661.

Electrons are grouped such that the structure remains electrically neutral at every point. (M26, Cu)

19-M. Contribution to the Study of the Iron-Phosphorus Diagram. Study of the Testing of Phosphide Grains. (In French.) P. Roquet and G. Jegaden. *Revue de Métallurgie,* v. 48, Sept. 1951, p. 712-721; Oct. 1951, p. 793-810.

A comprehensive experimental study. First part: The gamma-phase section of the diagram for bessemer steels and for P contents between 0.05 and 0.3%. Second part: The structure of ingots and plates. Optimum conditions of casting and of forging. 19 ref. (M24, D9, Fe, ST)

20-M. Some Examples of the Application of Semi-Microradiography to the Examination of Cast Aluminum Alloys. (In French.) A. Lahodny and F. Nonveiller. *Revue de Métallurgie,* v. 48, Oct. 1951, p. 778-786; disc., p. 786.

Laboratory tests on Al-Cu-Mg billets produced by ingot and continuous casting. Semimicroradiography can be useful for examining the crystallization process of light alloys if they contain constituents which absorb X-rays differently, and for examining large specimens. 10 ref. (M23, Al)

21-M. Use of Colored Films to Study Changes in Micrographic Structure of Type 80-20 Refractory Nickel-Chromium Alloys. (In French.) Charlotte Bückle and Jean Poulignier. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences,* v. 233, Oct. 15, 1951, p. 869-871.

Use of colored films formed on the surfaces of above alloys on attack by a boiling solution of 5 cc. conc. HF, 3cc. conc. HCl, and 50 cc. ethyl alcohol, to study structure changes due to aging for various times and temperatures. (M23, Ni, SG-h)

22-M. A New Surface Structure of "Stretched" Aluminum. (In German.) Heinz Wilsdorf and Doris Kuhlmann-Wilsdorf. *Naturwissenschaften,* v. 38, 1st Nov. no., 1951, p. 502.

The replica process is a preferred method of electron microscopy for showing the slip planes of elongated Al. (M21, Al)

23-M. Structure Investigations in the Aluminum Corner of the Aluminum-Iron-Silicon System. (In German.) L. Holik, H. Nowotny, and W. Thury. *Berg und Hüttenmännische Monatshefte der Montanistischen Hochschule in Leoben,* v. 96, Sept. 1951, p. 181-184.

Photomicrographs and graphs supplement brief discussion. 12 ref. (M24, Al)

24-M. The Cast Iron—Steel Limiting Alloy. (In Italian.) Giordano Bruni. *Metallurgia Italiana,* v. 43, Oct. 1951, p. 435-438.

There are two fundamental types of saturated austenite. One contains $Fe_{12}C$ and the other $Fe_{18}C$. Phase relationships involved. 20 ref. (M24, N8, CI, ST)

25-M. The Technique of Microradiography by Absorption and Some Examples of Application of This Method to Metallographic Investigations. (In Polish.) Z. Bojarski. *Prace Glownego Instytutu Metalurgii,* v. 3, no. 5, 1951, p. 417-428.

A theoretical approach to the methods used in microradiography and possibility of application these methods to practical problems. The microradiographic absorption method is developed. Practical instructions for preparation of target elements and selection of wave-length of radiation and voltage. 12 ref. (M23)

26-M. Experiment on Application of Electron-Microscopic Method to Investigation of Ores. (In Russian.) A. A. Ivanov. *Zapiski Vsesoyuznogo Mineralogicheskogo Obshchestva,* ser. 2, v. 80, no. 3, 1951, p. 167-174.

Applicability of electron microscopy, using the oblique-replica method, to mineralogical investigation of highly dispersed substances is confirmed by investigation of dispersion of fine gold particles within the grains of pyrite, as well as at the grain boundaries. (M21)

27-M. (Book) Phase Microscopy; Principles and Applications. Alva H. Bennett, Helen Jupnik, Harold Osterberg, and Oscar W. Richards. 320 pages. 1951, John Wiley & Sons, 440 Fourth Ave., New York 16, N. Y.

The authors have individually written the various chapters covering their specialties. Includes theory, instrumentation, techniques and applications. (M21)

28-M. (Book) Grundlagen der Metallkunde. (Fundamentals of Metalworking). Ed. 3, George Masing. 148 pages. 1951. Springer Verlag, Berlin, Germany. 12.60 D.M.

A collection of the author's university lectures. Differs from other textbooks on the same subject by its brevity and its restriction to principles. Technical problems, however, are also outlined. Starts with a survey of the problems and covers in 11 chapters a wide range of practical applications such as atomic structure, crystalline formation of alloys, thermochemical treatment, plastic forming, recrystallization, behavior against nonmetallic methods of attack, etc. (From review in *Chemical Age.)* (M25, M26, N general, Q24)

N

TRANSFORMATIONS AND RESULTING STRUCTURES

1-N. Disintegration of 45-50% Ferro-Silicon and the Generation of Poisonous Gases. A. K. Prestrud. *Journal of the Iron and Steel Institute,* v. 169, Oct. 1951, p. 107-109.

An experiment with ferrosilicon showed an uneven distribution of the different elements in the cast. The analytical figures are compared with data from the Fe-Si equilibrium diagram. Influence of Al on the disintegration of certain grades of ferrosilicon with evolution of phosphine; a cause for the disintegration is suggested. (N12, Fe-n)

2-N. Discussion on the Paper—"The Transformations $\alpha \rightarrow \gamma$ and $\gamma \rightarrow \alpha$ in Iron-Rich Binary Iron-Nickel Alloys," N. P. Allen and C. C. Earley. *Journal of the Iron and Steel Institute,* v. 169, Oct. 1951, p. 127-129.

Paper published in v. 166, Dec. 1950, item 49-N, 1951. (N8, Fe, Ni)

3-N. Joint Discussion on the Papers —"The Acceleration of the Rate of Isothermal Transformation of Austenite"; and "The Breakdown of Austenite Below the M_s Temperature," F. C. Thompson and M. D. Jepson. *Journal of the Iron and Steel Institute,* v. 169, Oct. 1951, p. 129-133.

Papers published in v. 162, 1949, p. 49-56; and v. 164, 1950, p. 27-35. See items 18B-90, 1949, and 31-N, 1950. (N8, ST)

4-N. Discussion on the Atlas of Isothermal Transformation Diagrams of B. S. EN Steels. *Journal of the Iron and Steel Institute,* v. 169, Oct. 1951, p. 137-144.

Deals with *Iron and Steel Institute* (London) Special Report 40, Mar. 1949, item 4B-91. (N8, AY)

5-N. Statement on the Occurrence of Graphitization in Carbon Steel of Stainless-Clad Vessels. *Welding Journal,* v. 30, Nov. 1951, p. 544s-545s.

Graphitization in the service life of vessels for petroleum refineries. Stresses caused by the cladding may be responsible. Aspects of future research. (N8, T29, CN)

6-N. A Theory of Globular Graphite Formation in Cast Iron. Ichiro Iitaka. *Reports of the Casting Research Laboratory,* No. 2, 1951, p. 1-4.

Considering the crystalline nature of graphite on one side, and the process of solidification of cast iron on another side, a hypothesis to explain nodular graphite formation is proposed. The experimental facts hitherto observed by other authors were explained by this hypothesis. 12 ref. (N12, CI)

7-N. Evolving Gases on Solidification of Molten Cast Iron. (Report 2) Minao Nakano. *Reports of the Casting Research Laboratory,* No. 2, 1951, p. 46-49.

Gases evolved during solidification of Penhsihu pig iron melted by various methods were collected and analyzed. The connection between graphitization and compositions of evolved gases was also studied. (N12, E25, CI)

8-N. Fundamental Aspects of Diffusion in Solids. Frederick Seitz. "Phase Transformations in Solids" (John Wiley & Sons, New York), 1951, p. 77-145; disc. p. 146-148.

Emphasis is placed on the theory of the mechanism of diffusion rather than on a detailed compilation of empirical data pertaining to different substances. Theory is applied to metals. 39 ref. (N1)

9-N. Nucleation Theory. R. Smoluchowski. "Phase Transformations in Solids" (John Wiley & Sons, New York), 1951, p. 149-180, disc. p. 180-182.

Considers such aspects as recrystallization, non-equilibrium conditions and fluctuations and embryos in equilibrium conditions. 40 ref. (N2)

10-N. Crystallographic Aspects of Phase Transformations. M. J. Buerger. "Phase Transformations in Solids" (John Wiley & Sons, New York), 1951, p. 183-209; disc. p. 209-211.

Since the structures of many of the crystalline phases involved in transformations are now well known, it is possible to discuss transformations of crystals from a structural viewpoint and to correlate profitably general thermodynamic features with specific structural characteristics. 18 ref. (N6, P12)

11-N. Transformations in Pure Metals. Charles S. Barrett. "Phase Transformations in Solids" (John Wiley & Sons, New York, 1951, p. 343-365.

Some current theories compared with experimental data. Analogies between transformations and related processes. 25 ref. (N6)

12-N. Order-Disorder Transitions in Metal Alloys. Sidney Siegel. "Phase Transformations in Solids" (John Wiley & Sons, New York), 1951, p. 366-383; disc. p. 383-386.

Effects of the order-disorder transition on electrical magnetic, and mechanical properties. 24 ref. (N10, P15, P16, Q general)

13-N. Precipitation From Solid Solutions of Metals. A. H. Geisler. "Phase Transformations in Solids" (John Wiley & Sons, New York), 1951, p. 387-535; disc., p. 536-544.

A comprehensive review of the mechanism of the precipitation proc-

ess correlated with the changes in properties that occur during aging. The complexities attendant upon the formation of a new phase are rationalized on the basis of changes in crystal structure and in microstructure. 830 ref. (N7)

14-N. The Eutectoid Reaction. Robert F. Mehl and Arthur Dube. "Phase Transformations in Solids" (John Wiley & Sons, New York), 1951, p. 545-582; disc., p. 582-587.

The principles which appear to govern the mechanism and the kinetics of eutectoid reactions. 32 ref. (N8, N9)

15-N. The Martensite Transformation. Morris Cohen. "Phase Transformations in Solids" (John Wiley & Sons, New York), 1951, p. 588-659; disc., p. 659-660.

General characteristics. Crystallographic aspects and the thermodynamics of the reaction. 103 ref. (N8)

16-N. Transformation of Low-Carbon, 12% Chromium Stainless Steels. A. E. Nehrenberg. *Metal Progress,* v. 60, Nov. 1951, p. 64-69.

Quantitative data to show the variation in amount of delta ferrite with temperature in 12.5% Cr stainless steels containing 0.06, 0.10, and 0.12% C. (N8, SS)

17-N. Formation of Annealing Twins During Grain Growth. R. L. Fullman and J. C. Fisher. *Journal of Applied Physics,* v. 22, Nov. 1951, p. 1350-1355.

Proposes that annealing twins form during grain growth as a result of a decrease in the interfacial free energy of grain boundaries that would not occur in the absence of twinning. Experiments designed to permit detection of the changes in grain-boundary free energy accompanying the formation of twins give results in agreement with this concept. The abundance of twins found in annealed Cu depends on the texture in a manner that is consistent with the theory. 11 ref. (N3, Cu)

18-N. Model for Dendrite Growth Form in Metals and Alloys. R. B. Pond and S. W. Kessler. *Journal of Metals,* v. 3, Dec. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 191, 1951, p. 1156-1162.

Several pure-metal specimens were solidified through a measured thermal gradient so a free surface and the liquid-solid interface could be examined. A line structure was observed on the surface and a hexagonal structure on the interface. A model to explain these forms is proposed. Metals studied were Pb, Sn, Al, and In.
(N12, Pb, Sn, Al, In)

19-N. Rate of Evaporation of Zinc at Low Pressures. H. W. St. Clair and M. J. Spendlove. *Journal of Metals,* v. 3, Dec. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 191, 1951, p. 1192-1197.

Automatic surface-follower mechanism used to measure the surface temperature and rate of evaporation of molten Zn while undergoing distillation at low pressure. At pressures of 50-100 microns Hg, rate of evaporation may be 60-80% of the theoretical maximum corresponding to the measured temperature. The rate decreases rapidly at pressures above 100 microns Hg. Measured temperature gradients at the surface are in agreement with theoretical gradients calculated from heat of vaporization, rate of evaporation, and thermal conductivity of molten Zn. (N16, Zn)

20-N. Eutectoid Decomposition of the Delta Phase of the Copper-Tin System. C. C. Wang and M. Hansen. *Journal of Metals,* v. 3, Dec. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 191, 1951, p. 1212.

Longtime annealings at 300° C. were conducted with alloys containing 22, 32.6, and 35% Sn prepared from electrolytic Cu and electrolytic Sn and cast in a small iron mold. Microstructures. (N9, Cu, Sn)

21-N. Hysteresis in Transitions in Solids. D. G. Thomas and L. A. K. Staveley. *Journal of the Chemical Society,* Oct. 1951, p. 2572-2579.

Hysteresis seems to be confined to those cases in which part, at least, of the change occurs almost isothermally. The theory of nucleation proposed by Turnbull is applied to such transitions. Difficulties in quantitative application of the theory, and range in which surface free-energy values would have to fall to account for observed hysteresis effects. The theory is qualitatively used in consideration of factors which affect the width of hysteresis loops and the sharpness with which transitions set in, and also of observed phenomena within the loops. (N2)

22-N. Contamination of Evaporated Films by the Supporting Material of the Source. O. S. Heavens. *Nature,* v. 168, Oct. 13, 1951, p. 664.

Experiments on the above in which an active Ta boat was used as evaporation source. Ag and Ge were examined, the evaporation being carried out at several temperatures. (N16, Ag, Ta, Ge)

23-N. Influence of Polygonization on Certain Properties of Aluminum. (In French.) D. McLean and A. E. L. Tate. *Revue de Métallurgie,* v. 48, Oct. 1951, p. 765-776; disc., p. 776-777.

Influence of polygonization on tensile strength at room temperature and on creep resistance. 14 ref. (N5, Q27, Q3, Al)

24-N. Phenomena in Supersaturated Solid Solutions. (In German.) U. Dehlinger. *Zeitschrift für Naturforschung,* v. 6a, Nov. 1951, p. 718-721.

It is thermodynamically deduced that the diffusion coefficient in supersaturated solid solutions is negative and thus leads to the formation of complexes. Accompanying potential limits and rising temperature reduce the size of the complexes. Applicability to metallic solid solutions. (N1)

25-N. (Book) **Phase Transformations in Solids.** R. Smoluchowski, J. E. Mayer, and W. A. Weyl, editors. 660 pages. 1951. John Wiley & Sons, 440 Fourth Ave., New York 16, N. Y. $9.50.

Papers by various authors divided into three main groups: theoretical physics, nonmetals, and metals. Pertinent ones are separately abstracted. (N general)

P

PHYSICAL PROPERTIES AND TEST METHODS

1-P. The Kinetics of the Dissolution of Zinc in Aqueous Iodine Solutions. L. L. Bircumshaw and A. C. Riddiford. *Journal of the Chemical Society,* Feb. 1951, p. 598-603; June 1951, p. 1490-1493.

The observed rate of dissolution is of first order with respect to iodine concentration and is directly proportional to apparent surface area of the Zn specimen over the range investigated. With the exception of specimens polished with rouge, method of preparation of the surface is without effect on rate. Part II: An increase in the concentration of KI produces a marked increase in the rate of dissolution of Zn in aqueous iodine solutions. (P13, R5, Zn)

2-P. Electrochemistry and the Science of Metals. Robert Piontelli. *Journal of the Institute of Metals,* v. 80, Nov. 1951, p. 99-107.

Historical account of the origin and growth of electrochemistry. The present state of knowledge on various aspects of electrochemistry that are closely related to metals. Particular attention to the bases of electromotive force. 25 ref. (P13, C23, L17)

3-P. Effect of Orientation on the Metallic Reflection of Polarized Light. D. H. Woodward and E. L. Bronson. *Nature,* v. 168, Oct. 27, 1951, p. 742-743.

The nature of three different types of anisotropic reflection. Investigation was carried out on etched monel metal, etched isotropic Al, and unetched anisotropic Be.
(P17, Ni, Al, Be)

4-P. Anomalous Resistance of Noble Metals Containing Paramagnetic Ions. A. N. Gerritsen and J. Korringa. *Physical Review,* ser. 2, v. 84, Nov. 1, 1951, p. 604-605.

Experiments reported by Gerritsen and Linde on diluted alloys of Mn in Cu, Ag, and Au reveal anomalies which are similar but more pronounced than those observed in samples of "pure" noble metals. Theoretical explanation.
(P16, Cu, Ag, Au)

5-P. The Saturation Magneto-Resistance of Iron-Aluminium Alloys. R. Parker. *Proceedings of the Physical Society,* v. 64, sec. B, Oct. 1, 1951, p. 930-931.

Measurements of resistivity and saturation magneto-resistance were made on two samples of iron containing 2.68 and 3.60% Al respectively, in the range 78-300° C.
(P16, Fe)

6-P. Some Applications of Thermodynamics to Process Metallurgy. W. R. Moore. *Metallurgia,* v. 44, Oct. 1951, p. 194-195.

Application of thermodynamics in miscellaneous ferrous and nonferrous ore roasting and reduction processes.
(P12, C general, D general)

7-P. Solubility of Gaseous Nitrogen in Gamma Iron and the Effect of Alloying Constituents—Aluminum Nitride Precipitation. L. S. Darken, R. P. Smith, and E. W. Filer. *Journal of Metals,* v. 3, Dec. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 191, 1951, p. 1174-1179.

Solubility of nitrogen-purified Fe and low-alloy steels was determined for the γ region (930°-1350° C.). The diffusivity of N_2 is estimated from the rate of approach to equilibrium. Investigations of Al-killed steels, held in N_2, disclose precipitation of AlN, the solubility of which is determined. 12 ref. (P13, N1, Fe, AY)

8-P. Effect of Varying the Rate of Reduction on the Magnetic Properties, Ultimate Tensile Strength, and Resistivity of 18/8 Stainless Steel Wire. Samuel Storchheim. *Journal of Metals,* v. 3, Dec. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 191, 1951, p. 1181-1183.
(P16, Q27, F28, SS)

9-P. Correlation Between Electrical Conductivity and Temperature Coefficient of Resistance of Solid-Solution Alloys. M. Hansen, W. R. Johnson, and John M. Parks. *Journal of Metals,* v. 3, Dec. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 191, 1951, p. 1184-1189.

As part of a research project sponsored by the Signal Corps Engineering Laboratories, which has the objective of obtaining a magnet wire of good conductivity and low temperature coefficient of resistance, a comprehensive literature survey, supplemented by experimental work,

revealed that a linear relationship exists for solid-solution alloys between the electrical conductivity and temperature coefficient. Data for Cu solid-solution alloys with P, Si, As, Sb, Al, Ni, Mn, Fe, Mg, Co, and Ti are charted, tabulated and correlated. 21 ref. (P15, Cu)

10-P. Vapor Pressures of Zinc Over AgZn Alloys. E. E. Underwood and B. L. Averbach. *Journal of Metals*, v. 3, Dec. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 191, 1951, p. 1198-1202.

Vapor pressures were measured by the dew-point method. The thermodynamic activities of silver, and the molar heats of formation, were calculated. Similar measurements were made for the ternary alloys formed by adding Au to AgZn. An apparent particle-size effect was observed for AgZn filings. The vapor pressure of Zn over AgZn filings is 15-20% higher than over the solid alloys. 11 ref. (P12, Zn, Ag)

11-P. Surface Tension of Solid Silver. E. R. Funk, H. Udin, and J. Wulff. *Journal of Metals*, v. 3, Dec. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 191, 1951, p. 1206-1208.

Measured by a refinement of the Udin, Shaler, and Wulff technique. The tests were made in a purified helium atmosphere at four different temperatures and various times. (P10, Ag)

12-P. Surface Tension of Solid Gold. F. H. Buttner, H. Udin, and J. Wulff. *Journal of Metals*, v. 3, Dec. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 191, 1951, p. 1209-1211.

Using a modified Udin, Shaler, and Wulff technique, the surface tension of Au in purified helium was found to be 1400±65 dynes per cm. for the range 1017-1042° C. (P10, Au)

13-P. A Proposed Alternative Method for Measuring the Electrical Resistance of Pipe Line Coatings. J. K. Ballou, R. P. Howell, J. W. Liljeberg and P. F. Offermann. *Corrosion* (Technical Section), v. 7, Dec. 1951, p. 438-440.

Based on a method previously reported in *Corrosion*. (See item 225-P, 1951.) (P15, L26, ST)

14-P. The Magnetic Susceptibility of Zinc at Liquid Nitrogen Temperatures. J. W. McClure and J. A. Marcus. *Physical Review*, ser. 2, v. 84, Nov. 15, 1951, p. 787-788.

The magnetic susceptibility of Zn parallel to the hexagonal axis was observed to be field dependent up to 85° K. The behavior at liquid nitrogen temperatures somewhat resembles the de Haas van Alphen effect with the amplitude of oscillation sharply decreased and the maxima and minima displaced in field strength. (P16, Zn)

15-P. Experiments With Audiofrequencies on Superconductors. B. Serin, C. A. Reynolds, J. R. Feldmeier, and M. P. Garfunkel. *Physical Review*, ser. 2, v. 84, Nov. 15, 1951, p. 802-805.

Experiments in which alternating and direct currents are superimposed on Sn wires in the superconducting state. Various anomalous behaviors can be traced to the a.c. skin effect, and it is concluded that experiments of this type are not suitable for determination of the relaxation time in the phase transition from superconducting to the normal states. (P15, Sn)

16-P. The Change in Electrical Resistance of Magnesium on Melting. F. Hubbard Horn. *Physical Review*, ser. 2, v. 84, Nov. 15, 1951, p. 855-856.

Describes an experiment. (P15, Mg)

17-P. The Anomalous Magnetoresistance of Bismuth at Low Temperatures. P. B. Alers and R. T. Webber. *Physical Review*, v. 84, Nov. 15, 1951, p. 863-864.

Results of investigation are compared with those previously found. (P16, Bi)

18-P. A Radial Heat Flow Apparatus for the Determination of Thermal Conductivity. A. C. Burr. *Canadian Journal of Technology*, v. 29, Nov. 1951, p. 451-457.

The apparatus was designed for routine measurement of thermal conductivity of materials in the range 0.001 to 0.1 c.g.s. units, but can be modified easily for measurements on metals or on refractory materials. Accuracy is estimated to be about ±5%. Data on Armco iron and petroleum coke are tabulated. (P11, Fe)

19-P. Ferromagnetic Resonance and the Internal Field in Ferromagnetic Materials. J. R. MacDonald. *Proceedings of the Physical Society*, v. 64, sec. A. Nov. 1, 1951, p. 968-983.

Forces which influence the direction of the magnetization vector of a ferromagnetic substance in an external magnetic field, and effects of these forces upon some of the phenomena of ferromagnetic resonance. A macroscopic viewpoint is adopted throughout, and all microscopic interactions are replaced by formulas for the magnetic potential energy density of the materials which involve the macroscopic magnetization vector. 22 ref. (P16, SG-n, p)

20-P. The Effect of the Mean Free Path of Electrons on the Electrical Properties of Non-Metals. R. W. Wright. *Proceedings of the Physical Society*, v. 64, sec. A, Nov. 1, 1951, p. 984-999.

The theories of the mean free path of electrons in various types of materials, under various conditions. The conductivity, thermoelectric power, Hall coefficient, fractional change of conductivity in a magnetic field, and the Kernst, Ettinghausen, and Righi-Leduc coefficients are all calculated upon the Lorentz-Sommerfeld theory for the various mean-free-path theories. Experimental evidence is found in general to support the theory given, both in impurity metals and semiconductors, except perhaps in the case of the thermoelectric power. (P15)

21-P. Electrical Conductivity of Metals at Low Temperatures; Equilibrium Between Electrons and Phonons. P. G. Klemens. *Proceedings of the Physical Society*, v. 64, sec. A, Nov. 1, 1951, p. 1030-1039.

A mathematical resolution of difficulties found in two existing theories. (P15)

22-P. The Thermal Conductivity of Cadmium in a Magnetic Field at Low Temperatures. K. Mendelssohn and H. M. Rosenberg. *Proceedings of the Physical Society*, v. 64, sec. A, Nov. 1, 1951, p. 1057-1058. (P11, Cd)

23-P. A Photo-Conductive Effect in Tellurium Film. W. T. Blackband. *Nature*, v. 168, Oct. 20, 1951, p. 704.

Investigation shows that resistivity of a Te film decreases on exposure to sunlight. (P17, Te)

24-P. A New Calculation of the Cohesive Energy of Metallic Beryllium. B. Donovan. *Nature*, v. 168, Nov. 10, 1951, p. 836-837.

Compares results obtained with those previously calculated in the literature. (P10, Be)

25-P. Magnetic Properties, Internal Strains, and the Bauschinger Effect in Metals. N. H. Polakowski. *Nature*, v. 168, Nov. 10, 1951, p. 838.

Findings upon which a general rule is formulated stating that work softening occurs whenever the method of cold working used tends to produce an internal stress system different from that remaining after preceding treatment, irrespective of whether the latter was of mechanical or of thermal nature. (P16, Q24)

26-P. Change of Resistivity of Gold by Cold Working at Liquid-Air Temperature and Its Recovery by Temporary Heating. M. J. Druyvesteyn and J. A. Manintveld. *Nature*, v. 168, Nov. 17, 1951, p. 868-869.

Graph shows recovery of resistivity as a function of heating temperature. Resistivity decreases at +35 and −50° C. Stress-strain curve is not changed by heating. (P15, Q27, Au)

27-P. Adsorption of Water Vapour on Solid Surfaces. F. P. Bowden, and W. R. Throssell. *Proceedings of the Royal Society*, ser. A, v. 209, Nov. 7, 1951, p. 297-308.

Two methods are used, the first a direct weighing of the adsorbed film on a microbalance and the second an examination of polarized light reflected from the surface. Studies were made on Au, Pt, Ag, Al, and zinc blends. 26 ref. (P13)

28-P. The Thermal and Electrical Conductivity of Sodium at Low Temperatures. R. Berman and D. K. C. MacDonald. *Proceedings of the Royal Society*, ser. A, v. 209, Nov. 7, 1951, p. 368-375.

Modern theories of metallic conduction, based on the quantum interaction of electrons with the lattice vibrations, predict a considerable variation of Lorenz number and temperature. Measurements of the thermal and electrical conductivity of two pure specimens of sodium continuously from 90 to about 4° K. were made, and an experimental Lorenz curve derived. 22 ref. (P12, P15, Na)

29-P. The Melting Curve at High Pressures. C. Domb. *Philosophical Magazine*, ser. 7, v. 42, Nov. 1951, p. 1316-1324.

An attempt is made to derive theoretically the Simon formula for variation of the melting point of solid with pressure. The model used is similar to that of Lennard Jones and Devonshire, but interpretation of the results is different. A formula of the right type results, but a detailed examination shows that the melting temperatures are much too high. Reasons for the discrepancy are discussed. (P12)

30-P. Sintered Nickel Steels. (In German.) F. Benesovsky. *Berg und Hüttenmännische Monatshefte der Montanistischen Hochschule in Leoben*, v. 96, Sept. 1951, p. 184-187.

Investigation of density, hardness, tensile strength, elongation, and structure of sintered Ni steels containing 2-14% Ni and 0-0.7% C. See also abstract from *Powder Metallurgy Bulletin*, item 147-P, 1951. (P10, Q27, Q29, M27, AY)

31-P. Theory of the Absolute Thermoelectric Potential of Thin Metal Layers and Wires. (In German.) E. Justi, M. Kohler, and G. Lautz. *Zeitschrift für Naturforschung*, v. 6a, Oct. 1951, p. 544-550.

Experimental and theoretical study. Compares results with those obtained from vapor-deposited Pb and Bi layers in order to explain the conduction mechanism of the experimental specimens. Also discusses partially elastic reflection of electrons from the interior "surfaces" of the metal, and confirms the Wiedemann-Franz-Lorenz law with respect to thermal and electric conductivity. (P15, P11, Pb, Bi)

32-P. Metallurgical Considerations As a Basis of Chemical Equilibrium. (In Portuguese.) Werner Grundig. *Boletim da Associacao Brasileira de Metais*, v. 7, July 1951, p. 221-239.

Fundamental laws, reduction of minerals, absorption of gases in molten metals, and processes of degasification. (P12, P13)

33-P. (Book) **Magnetic Materials. Ed. 2.** F. Brailsford. 156 pages. 1951. John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. $1.50.

The book might be subtitled: "Ferromagnetic Materials of Interest to the Electrical Engineer." The aim is to give the advanced student, the research worker, and those concerned with the technological applications of magnetic materials a comprehensive outline of the present state of knowledge of the subject. There seem to be only two references to articles published later than 1947. The coverage on commercial steels and alloys is extensive, even if far from complete. From review in *Chemical and Engineering News.* (P16, T1, SG-n, p)

Q

MECHANICAL PROPERTIES AND TEST METHODS; DEFORMATION

1-Q. Recent Contributions to the Theory of Plasticity. William Prager. *Applied Mechanics Reviews,* v. 4, Nov. 1951, p. 585-588.

A review. Numerous references. (Q23)

2-Q. The Form of an Aluminium Alloy Angle for Use as a Strut. C. G. Watson. *Engineer,* v. 192, Oct. 19, 1951, p. 482-485.

Design of an Al-alloy angle section giving greatest economy of material when used as a strut. The alloy used is Noral 51S-T. Its stress-strain relationship is shown graphically. From this is derived a graph in which stress is related to tangential modulus of elasticity; and from this, the Euler curve is constructed. (Q23, Al)

3-Q. Brittle Fracture of Mild Steel. T. S. Robertson. *Engineering,* v. 172, Oct. 5, 1951, p. 445-448.

Previously abstracted from *Engineer.* See item 608-Q, 1951. (Q23, ST)

4-Q. ML Aluminium Alloy; A Material for Elevated Temperatures. J. C. McGee. *Foundry,* v. 79, Dec. 1951, p. 112-113, 195.

See abstract of "ML Aluminum Casting Alloy—A Material for Elevated Temperatures," *CADO Technical Data Digest,* item 453-Q, 1951. (Q general, Al, SG-h)

5-Q. Factors Affecting the Quality of Cast Steel. T. N. Armstrong. *Foundry,* v. 79, Dec. 1951, p. 114-117, 207-208.

Effect of additions on mechanical properties is stressed. Micrographs and graphed and tabulated data. (Q general, E25, CI)

6-Q. Arc-Cast and Powdered Molybdenum Tested. J. H. Bechtold and Howard Scott. *Iron Age,* v. 168, Nov. 22, 1951, p. 92-95.

Unalloyed Mo has good ductility but becomes brittle at temperatures not much below freezing. Tensile and creep strengths at high temperature are low. Predicts that while further research should lead to useful alloys, molybdenum-base gas-turbine blades are unlikely. 11 ref. (Q23, T25, Mo)

7-Q. Measurement of the Distribution of Tensile and Bond Stresses Along Reinforcing Bars. R. M. Mains. *Journal of the American Concrete Institute,* v. 23, Nov. 1951; *ACI Proceedings,* v. 48, 1951, p. 225-252.

Tensile and bond stresses were measured along reinforcing bars by a new technique which does not disturb bond stresses. Curves for representative beam and pull-out specimens show tensile-force distribution, bond-stress distribution, applied moment vs. measured bar tension, comparison of beam and pull-out tensile-force distribution, and applied load vs. slip of the bar. Comparison of ordinarily calculated bond with measured local maximum values shows the calculated values to be frequently less than one-half the values measured in these tests. Evidence shows that cracks in beams decisively affect magnitude and distribution of tensile and bond stresses. (Q25, Q27, CN)

8-Q. Recent Progress in the Plastic Methods of Structural Analysis. P. S. Symonds and B. G. Neal. *Journal of the Franklin Institute,* v. 252, Nov. 1951, p. 383-407.

Recent developments in methods of plastic failure analysis based on certain simple hypotheses as to the carrying capacity of flexural members. The basic hypotheses are first defined and a simple example is given to illustrate their use. Certain physical assumptions are made concerning the carrying capacity of flexural members of mild steel. 19 ref. (Q25, ST)

9-Q. Slip Bands and Hardening Processes in Aluminium. A. F. Brown. *Journal of the Institute of Metals,* v. 80, Nov. 1951, p. 115-124.

Slip bands in Al increase in number during plastic deformation and, at the same time, further slip occurs within each band. At higher temperatures and lower rates of deformation, as well as with increasing strain under all conditions, the latter process becomes increasingly predominant. This is interpreted on the basis of the fine structure of slip bands resolved by the electron microscope. Differences in density and inner structure of slip bands formed under different conditions are compared with differences between stress-strain curves. (Q24, Al)

10-Q. The Creep and Softening Properties of Copper for Alternator Rotor Windings. N. D. Benson, J. McKeown, and D. N. Mends. *Journal of the Institute of Metals,* v. 80, Nov. 1951, p. 131-142.

Resistance to creep of a number of high-conductivity coppers was investigated in the range 130-225° C. Softening characteristics were also determined over the same temperature range. Creep resistance and resistance to softening were shown to be very much greater for Ag-bearing (0.1% Ag) than for Ag-free, tough-pitch Cu. Creep resistance and resistance to softening of OFHC Cu are greater than those of tough-pitch coppers when both are Ag-free. Ag-bearing (0.1%) OFHC and tough-pitch coppers have similar resistances to creep and softening. 12 ref. (Q3, Cu)

11-Q. An Investigation of the Structural Changes Accompanying Creep in a Tin-Antimony Alloy. W. Betteridge and A. W. Franklin. *Journal of the Institute of Metals,* v. 80, Nov. 1951, p. 147-150.

A Sn + 5% Sb alloy was used for a microscopical study of phenomena occurring during creep at room temperature. In addition to general slip within the grains and flow at the grain boundaries, it is shown that localized strain within the grains occurs in directions associated with boundaries between adjacent grains. It is also suggested from this work, and from an examination of a pure Al sample strained in creep at 250° C., that the "cell structure" observed by X-ray examination is a result of the break-up of the grains by slip bands and by local strains. 10 ref. (Q3, Sn, Al)

12-Q. Discussion of the Paper—"The Effect of Cold-Work on Steel," J. H. Andrew, H. Lee, and others. *Journal of the Iron and Steel Institute,* v. 169, Oct. 1951, p. 133-136.

Paper published in v. 165, June 1950, and Aug. 1950. See item 460-Q, 1950. (Q23, P15, ST)

13-Q. Tensile and Impact Properties of Iron and Some Iron Alloys of High Purity. W. P. Rees, B. E. Hopkins, and H. R. Tipler. *Journal of the Iron and Steel Institute,* v. 169, Oct. 1951, p. 157-168.

Tensile and impact properties of high-purity Fe and Fe-Mn, Fe-C, and Fe-C-Mn alloys, at various temperatures covering the tough to brittle transition. Technique used to carry out tests at low temperatures. Two types of brittleness, intergranular and cleavage, can occur in iron. Evidence indicates that oxygen is effective in promoting intergranular brittleness. It is also affected either by grain size or by some other factor resulting from the treatment used to obtain coarse grains. (Q23, Q27, Q6, Fe)

14-Q. Canadian Progress in Magnesium Extrusion Alloys. H. G. Warrington. *Modern Metals,* v. 7, Nov. 1951, p. 23-27.

By using high-purity metal made by the ferrosilicon process, the Canadians claim to have achieved a better combination of properties in wrought Mg alloys. During the past few years, Dominion Magnesium Limited has been conducting a program designed to simplify the range of wrought Mg alloys while achieving higher mechanical properties and good workability. The new Zn-Zr alloy, ZK61, has figured prominently in this program. (Q general, Mg)

15-Q. A Survey of Creep in Metals. A. D. Schwope and L. R. Jackson. *National Advisory Committee for Aeronautics,* Technical Note 2516, Nov. 1951, 66 pages.

Summarizes numerous theories relating to creep phenomena and the extent of current knowledge on the subject. Various possible mechanisms by which creep occurs both in single crystals and in polycrystals. 199 ref. (Q3)

16-Q. Testing Hot Metal Ladles. K. E. Knudsen, W. H. Munse, and B. G. Johnson. *Proceedings of the Society for Experimental Stress Analysis,* v. 9, no. 1, 1951, p. 11-18.

Strains were measured with SR-4 electric strain gages, and deflections by means of deflection dials reading to 1/1000 in. (Q25)

17-Q. Some Unorthodox Procedures in Photoelasticity. A. J. Purelli and Rex L. Lake. *Proceedings of the Society for Experimental Stress Analysis,* v. 9, no. 1, 1951, p. 97-122.

A diffused light polariscope and some simplified techniques which, it is hoped, will make possible the production of stress patterns of reasonably good quality by those who have neither the time nor the inclination to develop the skills required by conventional methods. Creep properties in photo-formaldehyde plastics; use in 2-3 dimensional photo-elasticity. 10 ref. (Q25)

18-Q. Characteristics of Wire Gages Under Various Conditions. Harry Majors, Jr. *Proceedings of the Society for Experimental Stress Analysis,* v. 9, no. 1, 1951, p. 123-139, disc., p. 139-140.

An experimental program in which the variation of gage sensitivity from −310 to 140° F. is reported for wire gages type A-3 and A-15 mounted on steel and Constantan beams, respectively. 52 ref. (Q25, ST)

19-Q. Characteristics of Electric Strain Gages at Elevated Temperatures. Emmett E. Day. *Proceedings of the Society for Experimental Stress Analysis,* v. 9, no. 1, 1951, p. 141-150.

Results of a test in which the gage factor was checked against temperature for 21 commonly used commercial SR-4 strain gages. (Q25)

20-Q. An Optical Strain Gage for Use at Elevated Temperatures. P. R. Weaver. *Proceedings of the Society*

for Experimental Stress Analysis, v. 9, no. 1, 1951, p. 159-162. (TG265 So13p)

An optical gage capable of operating at temperatures up to 500° F. It was designed and developed at the National Bureau of Standards for use in determining mechanical properties and for evaluating the performance of remote-reading strain gages at high temperatures. (Q25)

21-Q. Development and Use of High-Temperature Strain Gages. R. E. Gorton. *Proceedings of the Society for Experimental Stress Analysis*, v. 9, no. 1, 1951, p. 163-176.

Applications to engines. Various performance factors. (Q25)

22-Q. Resistance Wire Strain Gages in Product Development. W. H. Buckley and R. G. Anderson. *Proceedings of the Society for Experimental Stress Analysis*, v. 9, no. 1, 1951, p. 177-190.

Some applications of Baldwin SR-4 resistance-wire strain gages in product-development engineering, as well as some suggested methods and limitations in their use. (Q25)

23-Q. A Wire Resistance Strain Gage for the Measurement of Static Strains at Temperatures up to 1600° F. J. E. Carpenter and L. D. Morris. *Proceedings of the Society for Experimental Stress Analysis*, v. 9, no. 1, 1951, p. 191-200.

The application of high-temperature, wire-resistance strain gages to static testing. Techniques and apparatus used in fabricating and instrumenting the gage. The gage properties and some test results obtained by its use. (Q25)

24-Q. A Combined Stress Test Machine for Evaluating Heat-Resistant Alloys. William Foster. *Proceedings of the Society for Experimental Stress Analysis*, v. 9, no. 1, 1951, p. 211-220. (Q25, SG-h)

25-Q. A Realistic Approach to the Use of Titanium. Herman H. Hanink. *Product Engineering*, v. 22, Nov. 1951, p. 164-171.

Experimental work undertaken to determine mechanical properties of certain hot rolled and annealed alloys; effect of heat treatment on these properties; the difference in properties between forged parts and test-bar specimens; and behavior of machined Ti components subject to dynamic loading under simulated engine operating conditions. (Q general, Ti)

26-Q. Five Ways to Use Bonded-Wire Strain Gages. *SAE Journal*, v. 59, Nov. 1951, p. 28-29. (Excerpts from "Methods for Evaluating Loads and Stresses for Machine Design" by F. G. Tatnall.) (Q25)

27-Q. Many Ramifications of Wear Problem Discussed. V. A. Crosby. *SAE Journal*, v. 59, Nov. 1951, p. 30-31.

A survey on wear problems. Wear resistance of parts as related to the structure, hardness, and heat treatment of gray iron is stressed. (Q9, CI)

28-Q. Tests for SAE Grade 5 Bolts. A. S. Jameson. *SAE Journal*, v. 59, Nov. 1951, p. 54-59.

An investigation made to determine possible advantages in the use of torsion testing over tensile testing for the evaluation of bolts. Properties measured (proportional limit, torsional shear and degrees twist), correspond roughly to the three tensile properties: yield strength, tensile strength, and total elongation. (Q27, Q1, CN)

29-Q. The Fatigue Strength of Threaded Connections. R. C. A. Thurston. *Transactions of the American Society of Mechanical Engineers*, v. 73, Nov. 1951, p. 1085-1092.

Basic principles to be followed in the design of high-strength bolt and stud assemblies, the reasons underlying them and evidence in their support. Refers largely to steels. 31 ref. (Q7, ST)

30-Q. Buckling of Intermittently Supported Rectangular Plates. C. H. Norris, D. A. Polychrone, and L. J. Capozzoli. *Welding Journal*, v. 30, Nov. 1951, p. 546s-556s.

Studies of the buckling behavior of long rectangular plates intermittently supported on one or both long edges with various supports and loadings. Material studied was structural steel. (Q28, CN)

31-Q. Further Tests on Effects of Plastic Strain and Heat Treatment. Sadun S. Tor, Robert D. Stout, and B. G. Johnston. *Welding Journal*, v. 30, Nov. 1951, p. 576s-584s.

Covers transition-temperature test results of two plain carbon pressure-vessel steels in the following conditions: as-received, after 20% permanent tensile strain, after cylindrical bending and after hot or cold spherical pressing. (Q23, CN)

32-Q. Properties of Metals Used at Low Temperatures. *Welding Journal*, v. 30, Nov. 1951, p. 572s-575s.

A summary of nine papers previously published in the July 1951 issue of *Metal Progress* (Item 447-Q, 1951). Papers were presented at the Annual Metallurgical Conference and Open House held at the National Bureau of Standards on May 14 and 15, 1951. (Q general)

33-Q. High Strength Copper-Silver, Copper-Iron, and Copper-Iron-Chromium Wire. Webster Hodge, Ralph A. Happe, and Bruce W. Gonser. *Wire and Wire Products*, v. 26, Nov. 1951, p. 1033-1038, 1086.

Some new Cu-base alloys that have been made into wire to produce some unusual properties. The use of an insoluble metal like Fe, uniformly distributed as reinforcing fibers through the Cu matrix is an interesting new concept in wire making. (Q general, F28, Cu)

34-Q. A Study of Metal Transfer During Sliding, Using Radioactivation Analysis. E. Rabinowicz. *Proceedings of the Physical Society*, v. 64, sec. A, Oct. 1, 1951, p. 939-940.

A copper surface was slid over a steel surface, and as a result some Cu fragments were transferred to the steel. The steel specimen was then activated in a nuclear pile, and within a few hours of its removal from the pile an autoradiograph was made of its surface. Results are analyzed. (Q9, M23, Cu, ST)

35-Q. Cermets May Answer Jet Designers' Prayers. Parts I and II. W. J. Koshuba and J. A. Stavrolakis. *Iron Age*, v. 168, Nov. 29, 1951, p. 77-80; Dec. 6, 1951, p. 154-158.

While wear resistance, general high-temperature behavior and strength-to-weight ratio are good, cermets are less shock resistant, less ductile, and costly to produce. Applications in rockets, thermocouple protection tubes, induction-heating coils and electronic cathodes. (Q general, T25, T8)

36-Q. A Metallurgist Looks at Fracture. C. H. Lorig. *Metal Progress*, v. 60, Nov. 1951, p. 69-76.

Fracture aspect of metals. Demonstrates that microstructural features are responsible for several kinds of processes that can lead to fracture. Conditions of boundaries between grains and the nature of microconstituents at grain surfaces were studied. (Q26)

37-Q. Wrought Al-Zn-Mg Alloys. *Metal Progress*, v. 60, Nov. 1951, p. 114, 116, 118. (Condensed from "Observation on Some Wrought Aluminum-Zinc-Magnesium Alloys" by M. Cook, R. Chadwick and N. B. Muir.)

Previously abstracted from *Journal of the Institute of Metals*. See item 423-Q, 1951. (Q general, N12, Al)

38-Q. Properties and Uses of Lead and Its Alloys. W. H. Dennis. *Mine & Quarry Engineering*, v. 17, Dec. 1951, p. 391-394.

Emphasis is on mechanical properties. (Q general, T general, Pb)

39-Q. Mechanical Properties of Integrally Stiffened Aluminum Extrusions. Roberto Contini. *Product Engineering*, v. 22, Dec. 1951, p. 129-133.

Material properties, including values for skin and flanges, of integrally stiffened 24S and 75S Al alloy extrusions. Test results on behavior of tubular and flattened sections under column and bending loads. General comparison of data with design values. (Q general, Al)

40-Q. Heat Treated Brittle Coating Increases Sensitivity. A. J. Durelli and S. Okubo. *Product Engineering*, v. 22, Dec. 1951, p. 144-147.

Results of an investigation. Includes an example of a complete stress analysis using heat treated brittle coating on a valve under internal pressure. (Q25)

41-Q. The Nature of the Static and Kinetic Coefficients of Friction. Ernest Rabinowicz. *Journal of Applied Physics*, v. 22, Nov. 1951, p. 1373-1379.

Experiments were carried out to determine the transition between static and kinetic conditions when stationary metal surfaces are set into motion, a simple method being used which measures the energy that has to be given to one of the bodies to start it moving. The method is confined to cases in which the static coefficient exceeds the kinetic. 11 ref. (Q9)

42-Q. The Crystallographic Aspect of Slip in Body-Centered Cubic Single Crystals. I. Theoretical Considerations. A. J. Opinsky and R. Smoluchowski. *Journal of Applied Physics*, v. 22, Nov. 1951, p. 1380-1384.

The mechanism of slip in body-centered cubic lattices is considered in terms of the relation between the orientation of the tensile axis and the active slip system. (Q24)

43-Q. Distribution of Slip in Metal Crystals. F. C. Frank. *Journal of Applied Physics*, v. 22, Nov. 1951, p. 1387.

Discusses previous literature findings on deformation in Zn crystals. (Q24, Zn)

44-Q. Surface Effect in the Cleavage of Zinc Monocrystals. John J. Gilman. *Journal of Metals*, v. 3, Dec. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 191, 1951, p. 1148-1149.

Certain normally ductile Zn monocrystals become extremely brittle when their surfaces are coated with Cu oxide or plate. Etching away the oxide layer made the crystal ductile again. Details of the phenomenon and possible mechanisms. (Q23, Q24, Zn)

45-Q. Change in Yield Strength During Aging in Iron. C. A. Wert. *Journal of Metals*, v. 3, Dec. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 191, 1951, p. 1179-1180.

Results of experiments on high-purity Fe (Puron). Aging was done at 40, 65, and 130° C., respectively, after carburizing to about 0.015% C. (Q23, Fe)

46-Q. New Aluminum Alloy Has Improved 600° F. Properties. *Iron Age*, v. 168, Dec. 13, 1951, p. 131.

Mechanical properties of "ML" alloy, developed by the Air Force for high-temperature use. Melting practice and pouring temperature. (Q general, E10, E23, Al, SG-h)

47-Q. Fatigue Strength of Nodular Iron Tested. T. E. Eagan. *Iron Age*, v. 168, Dec. 13, 1951, p. 136-139.

Tests were carried out on specimens cut from both standard cylinders and actual castings. Endurance ratio for the material is ap-

proximately 0.34. A 0.050-in. notch reduces fatigue strength by a factor of 1.3 for heat treated material, 1.45 for as-cast. Elongation is usually lower in castings than in keel blocks. (Q7, CI)

48-Q. Nickel Saved by Substituting 430 for 18-8. *Iron Age,* v. 168, Dec. 13, 1951, p. 144.

Chemistry and mechanical properties of Type 430 chromium stainless. (Q general, SS)

49-Q. Physical and Mechanical Properties of Cast Iron. W. Leighton Collins. *Mechanical Engineering,* v. 73, Dec. 1951, p. 979-982. (Based on "Engineering Properties of Cast Iron", *American Foundrymen's Society.*)

From the viewpoint of an engineer designing a load-resisting member. A design procedure is outlined. (Q general, T26, CI)

50-Q. A Study of Tracer Methods for Assessing Wear of Wire-Drawing Dies. J. C. E. Button, A. J. Davis, and R. Tourret. *Nucleonics,* v. 9, Nov. 1951, p. 34-43.

Irradiation of tungsten carbide dies was used to provide a means of measuring die wear. The activity of die debris adhering to drawn wires was then quantitatively measured by Geiger counters. (Q9, S19, F28, C-n)

51-Q. Creep of Annealed and Cold-Drawn High-Purity Copper. William D. Jenkins and Thomas G. Digges. *Journal of Research of the National Bureau of Standards,* v. 47, Oct. 1951, p. 272-287.

A study was made of the effect of temperature and stress on the creep behavior at 110, 250, and 300° F. of high-purity, oxygen-free, high-conductivity copper initially as annealed and as cold-drawn to 40% reduction of area. Correlations are made of changes in structure with time, stress, temperature, and discontinuous flow. (Q3, Cu)

52-Q. The M.I.T. Laboratory of Cryogenic Engineering. S. C. Collins, W. C. Nason, Jr., and R. L. Cannaday. *Refrigerating Engineering,* v. 59, Dec. 1951, p. 1179-1182.

Equipment includes liquid-nitrogen plant, helium refrigerator, helium liquefier, and a tensile-testing machine to study stresses of metals at very low temperatures. (Q27)

53-Q. Mechanical Properties of Arc-Cast and Powder Metallurgy Molybdenum. James H. Bechtold and Howard Scott. *Journal of the Electrochemical Society,* v. 98, Dec. 1951, p. 495-504.

A survey. Micrographs, tables, and graphs. 14 ref. (Q general, Mo)

54-Q. Report on Nodular Cast Iron. *SAE Journal,* v. 59, Dec. 1951, p. 23-24, 26.

Correlation of test-bar properties. Comparison is made with malleable iron, steel castings, and gray iron. (Q general, CI)

55-Q. Vibration Failures. E. Colston Shephard. *Machine Design,* v. 23, Dec. 1951, p. 157-160, 208.

How service behavior of gas-turbine buckets is recorded and analyzed for design data. Continuous strain-gage record is radioed from plane in flight to a trailer on the ground. Diagrams show details of strain-gage system. (Q25)

56-Q. Inspection; NAI Students Design Unique Stress Testing Rings. James Corcoran. *Western Machinery and Steel World,* v. 42, Nov. 1951, p. 103-104.

New dynamometer test method and apparatus. (Q25)

57-Q. Resistance to Thermal Shock. C. M. Cheng. *Journal of the American Rocket Society,* v. 21, Nov. 1951, p. 147-153.

Resistance of ceramic and ceramal materials to thermal shock can be determined by analyzing the nonsteady thermal stresses in the material. First the nonuniform temperature distribution is computed by using the heat-conduction equation. This temperature distribution is then used to compute thermal stress. Coefficients of thermal conduction and of thermal expansion, ultimate strength, Young's modulus and Poisson's ratio together with heating conditions are used to specify resistance to thermal shock. The theory is verified by comparing the results with NACA test data. (Q25)

58-Q. Strengths of Several Steels for Rocket Chambers Subjected to High Rates of Heating. R. L. Noland. *Journal of the American Rocket Society,* v. 21, Nov. 1951, p. 154-162.

A series of tests was conducted to determine the tensile strengths of one carbon and 11 alloy steels when subjected to rates of heating comparable to those encountered by the metal parts of solid-propellant rocket motors. These results indicate that time at temperature has a very definite effect upon high-temperature strength characteristics of the steels investigated. (Q23, CN, AY)

59-Q. On the Transverse Mechanical Properties of Forgings. A. Bartocci. *Engineers' Digest,* v. 12, Nov. 1951, p. 377-378. (Translated from *Metallurgia Italiana.*)

Previously abstracted from original. See item 9-Q, 1951. (Q general, F22, CN)

60-Q. Development of Research in High-Temperature Rheology of Metals. (Continued.) Paul Feltnam. *Metal Treatment and Drop Forging,* v. 18, Oct. 1951, p. 455-459.

New methods which are slowly coming into prominence rely upon a detailed examination of the structural changes induced by heat and stress, rather than on simple mechanical tests. Apparatus is diagrammed and illustrated; photomicrographs show typical results. 22 ref. (Q24)

61-Q. Structural Changes During the Creep of Aluminium. *Metal Treatment and Drop Forging,* v. 18, Nov. 1951, p. 520-524, 528. (Based on a paper presented by Crussard and Wyon to the Société Francaise de Métallurgie in Paris.)

Results of an investigation on structural changes which occur particularly at high temperatures. 14 ref. (Q3, M27, Al)

62-Q. Temper Brittleness. J. Lomas. *Machinery* (London), v. 79, Nov. 22, 1951, p. 904-906.

Effect of alloying elements. A distinction is made between temper brittleness and blue brittleness. (Q23, ST)

63-Q. High-Temperature Embrittlement in Chromium-Iron Alloys Containing 12-16% Chromium. Helmut Thielsch. *Metallurgia,* v. 44, Nov. 1951, p. 220-226.

Embrittlement which may be shown by ferritic stainless steels on heating at elevated temperatures. Grain growth is not responsible and the suggestion is made that the embrittlement may be related to effects caused by solution of carbide at elevated temperatures. Means whereby the carbide solution may be prevented, or its effects overcome. (Q23, N8, SS)

64-Q. Some Factors Affecting Wear on Cemented Carbide Tools. E. M. Trent. *Engineer,* v. 192, Nov. 9, 1951, p. 599-600; *Machinery* (London), v. 79, Nov. 8, 1951, p. 823-829; Nov. 15, 1951, p. 865-869.

Experiments were carried out to determine the temperatures at which carbides react with steel to give a molten phase. A theory of cratering wear on carbide tools is proposed. (Q9, C-n)

65-Q. A Theoretical Derivation of the Plastic Properties of a Polycrystalline Face-Centered Metal. J. F. W. Bishop and R. Hill. *Philosophical Magazine,* ser. 7, v. 42, Nov. 1951, p. 1298-1307.

It is conjectured that the work done in plastically deforming a polycrystal is approximately equal to that which would be done if the grains were free to deform equally. In conjunction with the principle of maximum plastic work, this enables the yield function of an aggregate to be calculated. This is done for an isotropic aggregate of face-centered cubic crystals, following a determination of the stresses needed to produce multi-slip. (Q24)

66-Q. Formula for Creep Curves of Metals. Ryukiti Robert Hasiguti and Tosiro Owadano. *Nature,* v. 168, Oct. 20, 1951, p. 706.

Based on experiments on Al. (Q3, Al)

67-Q. Effect of Hydrogen on the Properties of Low-Alloy Steels. J. D. Hobson and C. Sykes. *Journal of the Iron and Steel Institute,* v. 169, Nov. 1951, p. 209-220.

A method by which hydrogen is introduced into steel specimens by heating them in the gas at high pressures. Its deleterious effect on the ductility of a number of low-alloy steels was investigated and shown to be reproducible, provided that their treatment is also considered. 12 ref. (Q23, AY)

68-Q. Macroscopic Surface Stresses Produced by Plastic Deformation. G. B. Greenough. *Journal of the Iron and Steel Institute,* v. 169, Nov. 1951, p. 235-241.

An investigation using a low-carbon steel containing 0.10% C., 0.36% Mn, 0.017% Si, and 0.007% P. Results show that there is a macroscopic compressive biaxial stress in the surface of an aggregate; the layer containing the stress being about two crystals ($8X10^{-3}$ in.) deep. 12 ref. (Q24, CN)

69-Q. The Fatigue of Metals; Grooved Parts. (In French.) M. Ros. *Revue de Métallurgie,* v. 48, Oct. 1951, p. 723-733.

Correlates results of tests made by LFEM during past 20 years, demonstrating that the Coulomb-Mohr theory can be considered as a general theory of the rupture of metals. (Q7)

70-Q. Behavior and Basic Principles of Metallic Structures. (In French.) J. F. Baker. *Revue de la Soudure; Lastijdschrift,* v. 7, No. 3, 1951, p. 128-146.

A review on the basis of the literature, with special regard to the ductility of steel. 37 ref. (Q23, ST)

71-Q. Pendulum Hysteresis Meter or Torsion Pendulum With Double Elastic Device for Measuring Internal Friction and Elastic Modulus of Metals in an Extensive Range From Very Low Temperatures up to 1300°. (In French.) Christian Boulanger. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences,* v. 233, Oct. 1, 1951, p. 732-733.

Tests and results obtained with the above instrument. (Q21, Q22)

72-Q. Relation Between Internal Friction and Resistance to Creep of Steel as a Function of Microstructure. (In French.) Christian Boulanger, Georges Delabart, and Michel Ravery. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences,* v. 233, Oct. 8, 1951, p. 794-796.

Results of study in which four different steel microstructure types were investigated. (Q22, Q3, M27, ST)

73-Q. Use of an Ethoxyline Resin in Three-Dimensional Photo-Elasticimetry According to a Solidification Technique. (In French.) Michel Ballet and Gaston Mallet. *Comptes Rendus*

hebdomadaires des Séances de l'Académie des Sciences, v. 233, Oct. 15, 1951, p. 846-847.

Comparison with a similar study by N. C. Foster. (Q25)

74-Q. Special Mechanical Properties of Aluminum Alloys Having a High Yield Point and High Tensile Strength. (In French.) Marcel Tournaire. *Revue de l'Aluminium*, v. 28, Oct. 1951, p. 353-361.

Effects of fabrication process on mechanical properties, giving the best yield and tensile strengths attainable with various common Al alloys. (Q23, Al)

75-Q. The Heat Resistance of Cast Iron and the Effect of Different Alloying Elements. (In German.) H. Timmerbeil, G. Clas, and O. Mattern. *Giesserei*, v. 38, (new ser., v. 4), Sept. 20, 1951, p. 476-482; Oct. 4, 1951, p. 523-526.

Review of literature. Heat resistance of normal cast iron, Si cast iron, Cr-Si cast iron, and Al-Si cast iron. Part II reports on experiments on the influence of P on the heat resistance of gray iron castings, and also on Si, Cr-Si, and Al-Si cast iron. An alloy of 1.85% C, 6% Si, 0.6% P, < 0.025% S, 4% Al and about 0.2% Ti proved to be particularly heat resistant.
(Q general, CI, SG-h)

76-Q. Aluminum - Zinc - Magnesium Base Alloys. (In German.) H. Hug. *Schweizer Archiv für angewandte Wissenschaft und Technik*, v. 17, Oct. 1951, p. 289-298.

Compositions, mechanical properties, transformations, and microstructures of various Al-Zn-Mg compositions. Only those which contain mostly Al are considered.
(Q general, N general, M27, Al)

77-Q. Testing Heat Resistant Materials. (In German.) W. Deisinger. *Schweizer Archiv für angewandte Wissenschaft und Technik*, v. 17, Oct. 1951, p. 299-305.

Absence of uniform standards of high-temperature property testing. Various methods of determining mechanical properties of metals and alloys at elevated temperatures. 10 ref. (Q general, SG-h)

78-Q. The Influence of Precipitation Processes Upon the Determination of Creep Resistance of Light-Metal Alloys. (In German.) H. Vosskühler. *Metall*, v. 5, Nov. 1951, p. 475-479.

In order to avoid structural changes during creep testing of light alloys, preliminary heating of the test rods is suggested. Method for the tests. Results seem most significant for Al-Mg alloys containing 3.50% Mg. 15 ref. (Q3, Al)

79-Q. The Hypothesis of Supporting Crystals in Metal Alloys for Bearings. (In German.) V. Schneider. *Metall*, v. 5, Nov. 1951, p. 490-494.

Application of the hypothesis to various bearing metals, in order to explain their frictional characteristics. It was found that other characteristics are more important for determining the suitability of an alloy for bearings. (Q9, T7, SG-c)

80-Q. Alternate Torsion Testing of Wires. (In Italian.) *Metallurgia Italiana*, v. 43, Oct. 1951, p. 421-424.

During the test, three distinct periods are evident: uniform deformation, localized deformation in a short length, and rupture. Results of application of this test to steels and several nonferrous alloys. (Q1)

81-Q. Some Data on the Influence of Forging Reduction on the Toughness of High Speed Steel. (In Italian.) Giorgio Magliano. *Metallurgia Italiana*, v. 43, Oct. 1951, p. 439-442.

Results of tests on round bars already reduced 50-96% in an attempt to reduce the minimum forging reduction necessary to obtain satisfactory core properties. Such reduction does not appear to be feasible. (Q23, F22, TS)

82-Q. Quality and Methods of Testing of Hoes. (In Portuguese.) Joao Gustavo Haenel and Rubens Lima Pereira. *Boletim da Associacao Brasileira de Metais*, v. 7, July 1951, p. 247-282.

A detailed comparative study of the technological characteristics of various kinds of Brazilian steel hoes in relation to well-known foreign-make steel hoes. (Q general, ST)

83-Q. Study of Properties of Sintered Steels. (In Portuguese.) Vicente Chiaverini and Carlos de Revoredo Barros. *Boletim da Associacao Brasileria de Metais*, v. 7, July 1951, p. 346-365.

Results of experiments on mechanical and physical properties using sintered steel of different compositions and method of preparation. (Q general, P general, ST)

84-Q. (Book) Simplified Mechanics and Strength of Materials. Harry Parker. 275 pages. John Wiley & Sons, 440 Fourth Ave., New York 16, N. Y. $4.00.

A survey of all the mechanical forces to be considered in construction. Specific applications to columns, rivets and welds, shafts, pipes, tanks, concrete retaining walls and dams. A wide variety of illustrative problems; also tables of allowable stresses, properties of sections, and other engineering data. (Q23, Q25)

R

CORROSION

1-R. Weathering Tests of Tin-Zinc Alloy Coatings on Steel. S. C. Britton and R. M. Angles. *Metallurgia*, v. 44, Oct. 1951, p. 185-191.

See abstract of "Corrosion Tests on Tin-Nickel", *Metal Industry*, item 332-R, 1951. (R11, Sn)

2-R. Rotogenerative Detection of Corrosion Currents. Joseph B. McAndrew, William H. Colner, and Howard T. Francis. *National Advisory Committee for Aeronautics*, Technical Note 2523, Nov. 1951, 12 pages.

A new technique for studying corrosion phenomena. The method permits the detection of the presence of currents produced by local cells on the surface of a corroding metal specimen. (R11)

3-R. Corrosion of Fourdrinier Wire Cloth. A. G. Hose. *Paper Mill News*, v. 74, Nov. 24, 1951, p. 16, 18; *Paper Trade Journal*, v. 133, Nov. 23, 1951, p. 22-23.

Various types of corrosion found in wire cloth composed of bronze warp and brass shute.
(R general, T29, Cu)

4-R. Selecting Alloys to Resist Corrosion. B. B. Morton. *Petroleum Processing*, v. 6, Nov. 1951, p. 1233-1235.

Types of alloys which are resistant to high-temperature corrosion from sulfur and organic acids and solvents. Protection of equipment in some of the newer refining methods, including solvent lubricating-oil manufacture. (R7, SG-g)

5-R. The Structure of Thin Layers of Zinc Oxide Grown on a Zinc Single Crystal. L. N. D. Lucas. *Proceedings of the Physical Society*, v. 64, Oct. 1, 1951, p. 943-945.

The fact that an electron diffraction pattern can be obtained from the Zn mother crystal through the overlying layer of ZnO makes it possible to set an upper limit to the thickness of this layer.
(R2, M22, Zn)

6-R. On Acid Resisting Silicon Steel. Ichiro Iitaka and Kazuhiko Sekiguchi. *Reports of the Casting Research Laboratory*, no. 2, 1951, p. 5-6.

Results of a study on corrosion resistance of 5.5% Si steel to HCl, adding various quantities of Cu to improve the resistance. (R5, AY)

7-R. Device Aids Corrosion Study. D. H. Stormont. *Oil and Gas Journal*, v. 50, Dec. 6, 1951, p. 92.

A device which permits corrosion coupons to be readily introduced or removed from pipe lines, heater tubes, and well-head equipment while they are in service. Corrosion resistance of various steels and metals under actual operating conditions can be studied. (R11)

8-R. Metallurgical Mechanism for Mercury Stress Cracking of Copper Alloys. W. D. Robertson. *Journal of Metals*, v. 3, Dec. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 191, 1951, p. 1190-1191.

Possible mechanisms and experimental results for Cu and for brass (69% Cu). (R1, R6, Cu)

9-R. Technical Practices in Cathodic Protection. *Journal American Water Works Association*, v. 43, Nov. 1951, p. 883-896.

Fundamentals of the application of cathodic protection, and the mitigation of any electrolytic corrosion that may be caused by stray current from cathodic-protection systems. 62 ref. (R10)

10-R. Potential Measurements for Determining Cathodic Protection Requirements. Scott P. Ewing. *Corrosion* (Technical Section), v. 7, Dec. 1951, p. 410-417; disc., 417-418.

Study shows that pipe lines or other buried or submerged structures can be protected against corrosion by maintaining them at some definite potential with cathodically applied current. The exact potential at which corrosion is stopped will vary with the environment.
(R10, ST)

11-R. Sodium Hydroxide as Inhibitor of Pitting in 18-8 Stainless Steel. J. W. Matthews and H. H. Uhlig. *Corrosion* (Technical Section), v. 7, Dec. 1951, p. 419-421, disc., p. 421-422.

The pitting mechanism results from galvanic action between a major surface of passive metal acting as cathode and a small active area of metal acting as anode. Potential measurements show that NaOH depresses the noble potential of passive 18-8 stainless steel, hence diminishing the operating potential of the passive-active cell. In addition, the fast-moving hydroxyl ion reacts with any passivity-destroying corrosion products such as $FeCl_2$ at the anode, thereby blocking the chain reactions that initiate pitting. (R2, R10, SS)

12-R. Corrosion Aspects of Fusion Welded Aircraft High-Strength Aluminum Alloys. Loren W. Smith. *Corrosion* (Technical Section), v. 7, Dec. 1951, p. 423-437, disc., p. 437.

Correlates metallurgical structures resulting from the fusion welding of Al alloys with corresponding corrosion data. Results of several investigations on the corrosion resistance of fusion welded 24S, 61S, and 75S Al alloys. Tensile-strength comparisons of bare and clad welded alloys exposed to corrosive mediums in the as-welded, aged, and reheat treated conditions. 19 ref.
(R general, Al)

13-R. The Mechanism of Knife-Line Attack in Welded Type 347 Stainless Steel. M. L. Holzworth, F. H. Beck, and M. G. Fontana. *Corrosion* (Technical Section), v. 7, Dec. 1951, p. 441-449.

Mechanism is based on the solid solubility of Cb in 18-8 stainless steels at high temperatures with subsequent formation of grain-boundary chromium carbide during the sensitizing treatment. This type of corrosion was observed in fuming HNO_3 and also in boiling 65% HNO_3. Experiments were conducted on regular Type 347 and extra-low-carbon

Type 347 stainless steels. The latter appeared to be less susceptible to knife-line attack. 12 ref. (R2, SS)

14-R. Construction Materials That Stop Sulfuric Acid Corrosion. 1 and 2. S. W. Shepard. *Industry and Power*, v. 61, Nov. 1951, p. 99-100; Dec. 1951, p. 85-86, 132.

Types and applications of materials that help in solution of problems involving corrosion, abrasion, heat, and pressure. Limitations in the use of cast iron and steel and ways of compensating for them. (R5, Pb, CI, ST)

15-R. Alcohol vs. Construction Materials. *Chemical Engineering*, v. 58, Nov. 1951, p. 288, 290, 292-294, 296-298, 300-302, 304-305.

Introductory portion by William C. Moore is followed by the following brief articles which discuss corrosion resistance of different articles to ethyl alcohol: "Worthite", W. E. Pratt; "Hastelloy", E. D. Weisert; "Glass Lining", S. W. McCann; "Coatings", Kenneth Tator; "High-Silicon Irons", Walter A. Luce; "Durimet 20", Walter A. Luce; "Rubber", O. S. True; "Chlorimets", Walter A. Luce; "Cements", Raymond B. Seymour; "Iron and Steel", A. W. Spitz; "Nickel and Nickel Alloys", W. Z. Friend; "Stainless Steel", W. G. Renshaw; "Aluminum", J. P. Balash and E. D. Verink, Jr.; "Silicones", J. A. McHard and Leon Van Volkinburg; and "Lead", Kempton H. Roll. (R7)

16-R. The Curing of Lead Storage Battery Plates. R. H. Greenburg, F. B. Finan, and B. Agruss. *Journal of the Electrochemical Society*, v. 98, Dec. 1951, p. 474-478.

A series of experiments made to determine the effects of variations in ambient temperature on the course of the oxidation reaction. The oxide used consisted of approximately 30% metallic lead, the remainder being litharge. (R2, Pb)

17-R. Corrosion of Materials. *Gas Times*, v. 69, Oct. 19, 1951, p. 117-118.

Results reported by the director of the Gas Research Board in his 1950 report. Includes photomicrographs showing structures of Pb-Sn and Pb-Ni coatings before and after corrosion for 350 hr. at 150° C. (R9, M27)

18-R. The Causes of the Localized Character of Corrosion on Aluminium. C. Edeleanu and U. R. Evans. *Transactions of the Faraday Society*, v. 47, Oct. 1951, p. 1121-1135.

Pitting and localized attack on aluminum is explained by the autocatalytic character of the anodic corrosion reaction; theoretical considerations suggest that if anodic current density becomes high at one point, it will tend to become higher, until checked by the evolution of hydrogen, which tends to produce a film of oxides or hydroxide over the point and slow down the reaction. 29 ref. (R1, R2, Al)

19-R. The Pitting of Zinc by Distilled Water and Dilute Solutions. U. R. Evans and D. E. Davies. *Journal of the Chemical Society*, Oct. 1951, p. 2607-2614.

The vertical arrangement of pits produced on zinc by distilled water, the corrosion products, and their formation, were studied. The vertical alignment is due to corrosion product from an upper pit lodging at points below, and screening them from oxygen; lines of pits can also be set up by the screening action of a polythene thread. A Zn disc whirled in distilled water containing oxygen suffers no pitting. In stagnant water containing oxygen under high pressure, Zn remains unchanged; at ordinary pressure, it becomes pitted. Results are explained on the basis of the theory of oxidation and corrosion advanced by Hoar and Evans. (R2, Zn)

20-R. Electrochemical Studies of Protective Coatings on Metals. Part III. The Correlation Between Conductance or Capacitance and Area of Breakdown of Paint on Steel Immersed in Sea Water. F. Wormwell and D. M. Brasher. *Journal of the Iron and Steel Institute*, v. 169, Nov. 1951, p. 228-234.

The relationship between the area of metal exposed at breaks in the paint film and measured conductance or capacitance was studied critically. (R11, R4, ST)

21-R. Chemical Plants—Protection of Steelwork. Leslie H. Griffiths. *Iron and Steel*, v. 24, Nov. 1951, p. 504-506.

Ways and means of protecting mild steel building framework against corrosion by contact with chemical vapors. Scale removal; burning, flame cleaning; priming paints; rubber coatings; binding with tape. (R10, L10, L26, CN)

22-R. Dry Oxidation and Wet Corrosion. U. R. Evans. *Nature*, v. 168, Nov. 17, 1951, p. 853-855.

Attempts to show that the above phenomena are not wholly disconnected on the basis that alloying constituents added to combat the former often prevent the latter. High-temperature oxidation, oxygen in wet corrosion, electrochemical mechanism, inhibitors, effects of sulfur and impurities. 19 ref. (R2)

23-R. Iron/Sulphide Ratios in Corrosion by Sulphate-Reducing Bacteria. C. J. P. Spruit and J. N. Wanklyn. *Nature*, v. 168, Dec. 1, 1951, p. 951-952.

An investigation on ingot iron shows that it is because of their sulfide-producing action that the bacteria stimulate corrosion. (R1, Fe)

24-R. Research on the Anodic Oxidation of Ferrochromium. II. Oxidation in Potassium Solution. III. Oxidation in Solutions of Carbonate, Bicarbonate, and Alkaline Chromate. (In French.) Jean Besson and Chu Yung Chao. *Bulletin de la Société Chimique de France*, Sept.-Oct. 1951, p. 763-772.

Two ferrochromium compositions were studied. (R5, Fe-n, Cr)

25-R. Belgian Research on Chromium-Molybdenum Steels. (In French.) P. Coheur. *Revue Universelle des Mines, de la Métallurgie des Travaux publics, des Sciences et des Arts appliques a l'Industrie*, ser. 9, v. 94, Oct. 1951, p. 336-348.

Fabrication of Cr-Mo steels for creep and corrosion resistance. Transformation curves, and effects of heat treatment, of temperature, of time, and of stress were studied. (R general, Q3, SS)

26-R. The Mechanism of Intergranular and Stress Corrosion of Aluminum-Magnesium and Aluminum-Zinc-Magnesium Alloys. (In French.) Pierre A. Jacquet. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 233, Oct. 15, 1951, p. 871-873.

New facts and their consequences as result of recent research of the author. (R2, Al)

27-R. Dissolution Rate of Iron in 0.1 N Hydrochloric Acid During the First Few Seconds. (In German.) Heribert Grubitsch and Hikka Väyrynen. *Werkstoffe und Korrosion*, v. 2, Oct. 1951, p. 362-365.

For polished test specimens, the increased dissolution rate in the first few seconds is due to presence of an oxide coating. Tests on specimen free of oxide show an increase in the initial solution rate in both aqueous and ethereal HCl. This is explained by increased reactivity of the active Fe atoms at the surface. Solubility curve of polished samples is compared with that of coarsely filed samples. 10 ref. (R5, Fe)

28-R. Phase Boundary Lines, Especially Their Significance in Corrosion. (In German.) Rudolf Auerbach. *Werkstoffe und Korrosion*, v. 2, Oct. 1951, p. 365-367.

Boundary lines for the cases of two phases having a common plane, and three phases having only a common boundary line. Adsorption in the first case and "adlineation" in the second both diminish the free energy and activity of the boundary, thus inhibiting corrosion. Application to local cells, glow cathodes, and catalysts consisting of several components. (R10, P12)

29-R. Corrosion Protection for Light Steel Construction. (In German.) Wilhelm Wiederholt. *Werkstoffe und Korrosion*, v. 2, Oct. 1951, p. 372-377.

Deals with light structural members enclosed in building structures where corrosive conditions are often unfavorable. Application of various metallic and organic coatings. (R3, L general, ST)

30-R. Measurement of the Oxide Film on Platinum. II. (In German.) Heribert Grubitsch and Fritz Tödt. *Werkstoffe und Korrosion*, v. 2, Nov. 1951, p. 415-416.

A theory of the mechanism of oxide formation on Pt is developed. The various results of Tödt and of Grubitsch, especially the time dependence of oxygen charging of a Pt surface in an oxygen-containing electrolyte, can be explained on the basis of the theory. (R2, Pt)

31-R. Corrosion by Smelter Fumes. (In German.) Otto Gerhardt. *Werkstoffe und Korrosion*, v. 2, Nov. 1951, p. 425.

Corrosion by smelter fumes in recovery of Cu from secondary brass. Main contaminants are Zn, Pb, and Sn oxides. (R9, A8, ST, Cu)

32-R. Research on Stainless Steels. Part II. Some Measurements of Their Resistance to Intercrystalline Corrosion. (In Italian.) Antonio Ferri. *Metallurgia Italiana*, v. 43, Oct. 1951, p. 432-434.

Tests were made on three types of austenitic 18-8 steels in order to evaluate the sensitivity of the Strauss test and of tests in boiling HNO_3. The former was found to be more sensitive. The spread in corrosion results is related to a number of factors such as grain size, amount of carbide precipitation, and surface conditions of samples. 23 ref. (R2, SS)

33-R. (Book) **Corrosion Guide.** Erich Rabald. 629 pages. 1951. Elsevier Publishing Co., Inc., 445 Park Ave., New York 22, N. Y.

The old tried methods are catalogued with their advantages and deficiencies. Tabular arrangement of performance of materials in use gives the user an opportunity of finding out easily about other materials. General considerations on the selection of materials. A short introduction to the general aspects of corrosion, a knowledge of which leads to better use of the data given later. Bibliography of the most important books and journals. (R general)

S

INSPECTION AND CONTROL

1-S. Know Your Inspection Tools. H. E. Linsley. *American Machinist*, v. 95, Nov. 12, 1951, p. 147-158.

Special report on dimensional gaging equipment. (S14)

2-S. The Detection of Metallic Elements. Christin C. Miller. *Chemistry & Industry*, Oct. 6, 1951, p. 831-834.

Use of chemical methods. 31 ref. (S11)

3-S. Automatic Conveyorized Unit Used in Black-Light Inspection.

Foundry, v. 79, Dec. 1951, p. 102-103, 225.

A specially designed automatic conveyorized Zyglo unit was installed for receiving inspection of assorted malleable and gray iron castings received at Caterpillar. (S13, CI)

4-S. Ambient Temperature Independent Thermopiles for Radiation Pyrometry. William G. Fastie. *Journal of the Optical Society of America*, v. 41, Nov. 1951, p. 823-829.

Experimental and theoretical analyses which have formed the basis for several designs for thermopiles whose voltage output is not affected by ambient temperatures below 225° F. The techniques are applicable to other types of radiation thermopiles and to bolometers, the analysis prescribing the ambient temperature limits and source temperature limits between which satisfactory performance may be anticipated. (S16)

5-S. Radioactive Materials in Industrial Metallurgy. Sheila M. Holgate. *Metallurgia*, v. 44, Oct. 1951, p. 179-184.

A brief general discussion of radioactivity followed by detailed consideration of its use in metallurgy. 45 ref. (S19)

6-S. Alpha-Particle Assay and the Measurement of the Thorium-Uranium Ratio in Radioactive Ores. D. H. Peirson. *Proceedings of the Physical Society*, v. 64, sec. B, Oct. 1, 1951, p. 876-888.

Measurement of the alpha-particle activity of a "thick" radioactive source containing the natural radioactive series. Two methods of determining the Th-U ratio are considered for use in ore or mineral assays. (S11, Th, U)

7-S. Xeroradiography Can Cut X-Ray Inspection Costs. M. D. Phillips and S. A. Wenk. *Iron Age*, v. 168, Nov. 29, 1951, p. 86-89.

Use of new dry radiographic process which has several advantages in industrial radiography. Plates are used repeatedly and are not spoiled by accidental exposure to light, X-rays, or nuclear radiation. The image may be quickly developed by a simple method and transferred to ordinary paper. (S13)

8-S. Notes on Pyrometry. Gerard M. Wolten. *Metal Progress*, v. 60, Nov. 1951, p. 91-92.

Sensing elements of temperature-measuring devices. Factors such as heat imput, heat loss, and heat exchange as affecting thermocouple determinations. Various forms of pyrometers. (S16)

9-S. Fluoroscopic Inspection of Light Metal Castings. Justin G. Schneeman and T. E. Piper. *Metal Progress*, v. 60, Nov. 1951, p. 93-96.

The major limiting factors. Safety requirements needed in use. Various applications. (S13, EG-a)

10-S. Precise Temperature Control. Charles F. Rains and Robert C. McMaster. *Electrical Manufacturing*, v. 48, Dec. 1951, p. 110-113, 250-252, 256.

Thyratron temperature regulator which provides an extremely fast and sensitive control for conduction-heating currents. Facilitates accurate control of temperature for investigating material properties at high temperatures. Diagrams and bibliography on applied electronics. (S16)

11-S. Full Analysis of Design and Service Conditions Essential in Selecting Heat Resistant Alloys. R. T. Pamment. *Western Metals*, v. 9, Nov. 1951, p. 50-51.

Principles to be applied in selection of alloys for particular applications requiring heat or corrosion resistance, or both. (S21, T general, SG-g, h)

12-S. A.S.T.M. Specifications for Soft Solder Metal. The Melting Range of Tin-Lead Solders. *Tool Engineer*, v. 27, Dec. 1951, p. 53-54.

Tabular data. (S22, P12, Pb, Sn, SG-f)

13-S. Statistical Quality Control of Metalworking Operations. Parts III and IV. Lester F. Spencer. *Steel Processing*, v. 37, Oct. 1951, p. 506-508; Nov. 1951, p. 567-568, 576.

Use of control charts. Advantages and disadvantages. 16 ref. (S12)

14-S. Spectrochemical Analysis of Bronze by a Porous Electrode Method. Bourdon F. Scribner and John C. Ballinger. *Journal of Research of the National Bureau of Standards*, v. 47, Oct. 1951, p. 221-226. (S11, Cu)

15-S. Spectrophotometric Determination of Bismuth in Lead-Base and Tin-Base Alloys. Bruce B. Bendigo, Rosemond K. Bell, and Harry A. Bright. *Journal of Research of the National Bureau of Standards*, v. 47, Oct. 1951, p. 252-255. (S11, Pb, Sn)

16-S. Recording Ultra Rapid Changes in Temperature. B. Luyet and F. Gonzales. *Refrigerating Engineering*, v. 59, Dec. 1951, p. 1191-1193, 1236.

A detecting and recording instrument used to measure a change of several hundred degrees per second. (S16)

17-S. Temperature Measurement and Control. J. L. Garrison. *Industrial Heating*, v. 18, Sept. 1951, p. 1562, 1564, 1566, 1568, 1570, 1572.

Various temperature measuring systems and equipment used in gas-fired installations. Automatic control systems used to regulate temperatures of gas-burning equipment and the selection of the proper control system for a given gas-heated process. (To be continued). (S16)

18-S. Betatron Radiography. D. G. Wyatt. *Photographic Journal*, v. 91B, Sept.-Oct. 1951, p. 102-105.

Technique used in radiographing a steel object (a lathe chuck) with 9.6 mev. betatron radiation. (S13, ST)

19-S. Photometric Determination of Iron Traces in Zinc and Aluminium. *Chemical Age*, v. 65, Dec. 1, 1951, p. 735-738.

Effect of acid concentration and of sulfosalicylic acid content; sensitivity of the quantitative detection of Fe in solutions free from foreign salt; and effects of Zn, Al, Zn and Al contaminants. (S11, Fe, Zn, Al)

20-S. Photometric Measurement of Particle Size and Relative Surface Area. R. J. T. Charles. *Canadian Mining and Metallurgical Bulletin*, v. 44, Nov. 1951, p. 722-729; *Transactions of the Canadian Institute of Mining and Metallurgy*, v. 54, 1951, p. 452-459.

An apparatus for measuring the surface area of a few of the simple minerals with a high degree of accuracy consists essentially of a photometric device that will measure the turbidity of fine-particle suspensions. (S14)

21-S. Inorganic Chromatography on Cellulose. Part VI. The Extraction and Determination of Gold. N. F. Kember and R. A. Wells. *Analyst*, v. 76, Oct. 1951, p. 579-587.

Two chromatographic methods for the quantitative separation of gold from many other metals. Special attention is given to the separation of Au from the six Pt metals. (S11, Au, EG-c)

22-S. A Period Immersion Pyrometer. Appendix: An Alternative Method. T. Land and R. Barber. *Journal of the Iron and Steel Institute*, v. 169, Nov. 1951, p. 243-244.

A method of period immersion pyrometry was developed for use on high-frequency furnaces using normal types of immersion pyrometer, fitted with fused alumina dipping tuoes, which are coated with alumina cement to minimize heat shock. Immersion periods of up to 2 hr. were obtained. Experiments on other uses of the technique. In the appendix, the alternative apparatus is described and diagrammed. (S16)

23-S. Pyrometers for Surface-Temperature Measurement. M. D. Drury, K. P. Perry, and T. Land. *Journal of the Iron and Steel Institute*, v. 169, Nov. 1951, p. 245-250.

Three improved pyrometers designed to measure the temperature of hot surfaces in cool surroundings, with particular reference to the requirements of the steel industry. (S16)

24-S. Radioactive Isotopes; Some Applications in the Metal Industry. K. Fearnside. *Metal Industry*, v. 79, Nov. 16, 1951, p. 415-418.

Various examples to show the wide range of problems that can be tackled by the use of radioactive isotopes. (S19)

25-S. The Spectrographic Determination of Alumina in Silica Brick. W. S. Sykes and D. Manterfield. *Metallurgia*, v. 44, Oct. 1951, p. 267-270.

A simple method of determining the Al content of silica bricks by spectrographic means, having an accuracy of the order of $\pm 0.05\%$ Al. The method may also have possibilities for use in spectrographic analysis of other oxide-bearing materials such as slags. (S11)

26-S. The Determination of Iron, Nickel and Manganese in Copper Base Alloys. G. W. C. Milner and H. Groom. *Metallurgia*, v. 44, Oct. 1951, p. 271-275.

Absorptiometric methods for the individual determination of Fe, Ni, and Mn in most types of Cu-base alloys. A composite scheme for determination of these elements from a single sample weight which is advantageous for alloys requiring determination of all three elements. (S11, Cu)

27-S. Magnetically-Operated Temperature-Detection Switch. *Engineering*, v. 172, Nov. 23, 1951, p. 671.

Device employs a fixed temperature-sensing element held in contact with a permanent magnet by mutual attraction. (S16)

28-S. Review of Present-Day Steelfoundry Radiographic Practice. G. M. Michie. *Foundry Trade Journal*, v. 91, Nov. 29, 1951, p. 615-624; disc., p. 624-626.

Development and present status with emphasis on safety precautions and on the wider application of the process made possible by the availability of cheap radioactive isotopes. (S13, S19, CI)

29-S. Measuring the Thickness of Layers or Thin Films. (In French.) Rudolf Berthold. *Metaux: Corrosion—Industries*, v. 26, Sept. 1951, p. 369-374.

Measurement of thin films and sheets up to 1 mm. thick, linings over 1 mm. thick, and ferromagnetic and non-ferromagnetic layers. (S14)

30-S. Spectrochemical Analysis of Steelmaking Slags; Preparation of Synthetic Standards by Sintering. (In French.) René Castro and René Loude. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 233, Oct. 29, 1951, p. 1031-1033.

Rapid and accurate techniques for analysis of various types of the slags containing 30-70% CaO; up to 50% Al_2O_3; 20-30% SiO_2, FeO, Cr_2O_3, or MgO; and a few per cent of TiO_2 or MnO_2. (S11)

31-S. Determination of Traces of Sodium, Copper, and Rare Earths in High-Purity Aluminum by the Pile-Activation Method. (In French.) Philippe Albert, Michel Caron, and Georges Chaudron. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, v. 233, Nov. 5, 1951, p. 1108-1110.

Development of procedure in which the specimens are exposed in an atomic pile. The formation of radioactive isotopes of trace impurities makes possible determination of the amounts present. (S11, S19, Al)

32-S. Nondestructive Crack-Detection Method Using Radioactive Indicators. (In German.) K. Kaindl and A. Mathiaschitz. *Werkstoffe und Korrosion*, v. 2, Oct. 1951, p. 368-369.

The method and typical results on different steels. Micrographs and macrographs. (S19, S13)

33-S. Use of X-Rays in the Foundry. (In Czech.) R. Kleda and J. Zabrs. *Hutnické Listy*, v. 6, Sept. 1951, p. 429-432.

Use for inspection of T-shaped castings. (S13)

34-S. (Book) **The Instrumentation of Open-Hearth Furnaces.** 151 pages. 1951. George Allen & Unwin, Ltd., 40 Museum St, London W.C. 1, England.

Basic principles, including those of automatic control. Applications to individual furnaces to determine working conditions necessary. Part II gives a brief description in nontechnical language of the proprietary instruments most commonly used in British melting shops. (S16, S18, D2, ST)

T

APPLICATIONS OF METALS IN EQUIPMENT

1-T. What Are the Cost Factors in Electric vs. Gas Furnace Operations? A. D. Spillman. *Electrical World*, v. 136, Nov. 19, 1951, p. 108-111.

As applied to various metallurgical and nonmetallurgical operations. (T5)

2-T. Modern Trends in Lithography. *Graphic Arts Monthly and the Printing Industry*, v. 23, Nov. 1951, p. 65, 68, 70, 72, 74, 76, 78.

Use of Monel metal and stainless steel for lithographic plates. (T9, SS, Ni)

3-T. Developments in the Use of Stainless Steel. John L. Cotsworth. *Iron and Steel Engineer*, v. 28, Nov. 1951, p. 66-68.

Emphasizes steel-plant applications. (T5, SS)

4-T. The Progress and Future of Structural Aluminium. C. Marsh. *Light Metals*, v. 14, Oct. 1951, p. 562-563. (T26, Al)

5-T. Light Alloy Fire Tender. *Light Metals*, v. 14, Oct. 1951, p. 566-567.

Small Al-alloy fire engine for use in rural districts. (T21, Al)

6-T. Minor Uses of the Light Metals. VI. Aluminium in Metallurgical Control. *Light Metals*, v. 14, Oct. 1951, p. 579-583.

Applications, mainly in steel and iron deoxidation, nitrogen stabilization, etc. Uses as an alloying element to improve various properties. (T general, B22, Al, ST)

7-T. Magnesium in Radar Plotting Equipment. *Magazine of Magnesium*, Nov. 1951, p. 1-6. (T1, Mg)

8-T. Microphones Made Good Use of Die Castings. L. R. Burroughs. *Materials & Methods*, v. 34, Nov. 1951, p. 69-70.

Varied applications of Zn-alloy die castings in microphones. (T1, Zn)

9-T. Manufacturers Designations for Electronic Cores Produced From Metal Powders. *Materials & Methods*, v. 34, Nov. 1951, p. 103.

Correlates basic material designations with manufacturers' names. (T1, H general)

10-T. Irrigation With Aluminum Pipe. A. T. Race, Jr. *Modern Metals*, v. 7, Nov. 1951, p. 30-32.

New technique. Use of Al pipe makes it much easier to move the system from place to place. (T3, Al)

11-T. Higher; Faster; Farther! *Modern Metals*, v. 7, Nov. 1951, p. 35-36.

Various applications of Mg in the Douglas Skyrocket and Consolidated-Vultee's B-36 bomber. (T24, Mg)

12-T. Packaging With Aluminum Foil. *Modern Metals*, v. 7, Nov. 1951, p. 41-44, 47-48, 50.

An illustrated survey of applications. (T10, Al)

13-T. How to Get Good Sleeve Bearing Life. *SAE Journal*, v. 59, Nov. 1951, p. 40-44. (Excerpts from "Sleeve Bearing—Design, Manufacture & Installation," by Richard J. Schager).

Application of various metals in bearings in internal-combustion engines. (T7, SG-c)

14-T. Adhesive Metal Nameplates Give Permanent Identification, *Steel*, v. 129, Nov. 19, 1951, p. 104.

Millions of paper-thin Al appliques now are being produced for use on hundreds of objects ranging from golf clubs to refrigerators in addition to airplanes. The product, tradenamed Metal-Cal, was developed by Boeing Airplane Co. First, a color-retentive coating is created on the surface of the foil by chemical reaction. Printing is then applied by a standard Multilith offset process. The processing can be made to reproduce any color. (T9, L14, Al)

15-T. A Steel Shortage Overcome. *Chemical Engineering*, v. 58, Nov. 1951, p. 177.

Use of "ELC" (extra-low-carbon) stainless steels developed by Armco as substitute for stabilized stainless steels. They are particularly valu-

able as weldments for duct work, smoke stacks, piping, pulp digesters, processing vessels, acid tanks, and air-conditioning equipment. Mechanical properties and weldability. (T29, T27, Q general, K9, SS)

16-T. Vast Expansion in Aluminum Output Carries Potential Impact on Building. *Engineering News-Record*, v. 147, Nov. 22, 1951, p. 28-29.

Prospects of more extensive application of Al in construction work because of greater availability in the future. (T26, Al)

17-T. Cast Production Molds. John Starr. *Tool Engineer*, v. 27, Dec. 1951, p. 40-43.

Techniques involved in production of patterns, molds, and alloys for metal and nonmetal forming and casting. (T5, E11, CI)

18-T. Stronger Threads in Aluminum Castings. James J. Oussani. *Electrical Manufacturing*, v. 48, Dec. 1951, p. 274.

Use of stainless steel Heli-Coil thread inserts, in the automatic Staplex machine, to prevent stripping of 6-32 threads in the aluminum frame. (T7, SS, Al)

19-T. Lithium Minerals Provide Unique Industrial Raw Material. P. E. Landolt. *Mining Engineering*, v. 3, Dec. 1951, p. 1045-1048.

Applications of Li and Li compounds in various industries. (T general, Li)

20-T. TV Picture Tubes With Iron Envelopes. C. S. Szegho and R. G. Pohl. *Tele-Vision Engineering*, v. 2, Nov. 1951, p. 8-9, 26-27.

Manufacturing techniques developed for the fabrication of tubes which feature envelopes with chromium-iron sealing beads and all-iron cones. The cone is first glazed with vitreous enamel and then joined to the metal by an arc welding process. (T1, L27, K1, Cr, Fe)

21-T. Carbides. 1951 Developments for 1952 Applications. *Magazine of Tooling and Production*, v. 17, Dec. 1951, p. 60, 62.

Successful experimental use of cemented tungsten carbide bearings under high speed, high load, and temperature conditions where conventional bearings fail; and the possibility of being able to hard surface metal parts with a relatively thin "skin" of ultra-hard, wear resisting tungsten carbide. In the latter process, tungsten carbide is flowed onto metal surfaces using conventional shielded arc equipment. (T7, L24, C-n)

22-T. Aviation Metallurgy Inside the U.S.S.R. Henry Brutcher. *Aero-Digest*, v. 63, Dec. 1951, p. 48, 50, 52.

An indirect review of alloys now being used in Russia for aircraft construction. (T24)

23-T. Noble Metals in Chemical Apparatus; Some Recent German Constructional Materials. *Chemical Age*, v. 65, Nov. 10, 1951, p. 627-628.

Reviews recent developments. (T29, EG-c)

24-T. Metals for Gas Turbines (Land and Marine). J. M. Robertson. *Journal of the Birmingham Metallurgical Society*, v. 31, Sept. 1951, p. 122-148.

Surveys the above, including properties, fabrication processes, etc. Includes table of materials available and parts in which they are at present being used or considered for use in construction of gas turbines. See abstract from Iron & Steel Inst. "Symposium on High Temperature Steels & Alloys for Gas Turbines," item 359-T, 1951. (T25, SG-h)

25-T. Handicraft in Aluminium. A. E. Rushbrook. *Light Metals*, v. 14, Sept. 1951, p. 529-534; Oct. 1951, p. 584-589; Nov. 1951, p. 622-630.

Methods for combining the unique properties of light metal in pursuit of hobby craftsmanship. (T9, Al)

26-T. Interim Report of Service Trials of Steel Coal Wagons (1939-1950). J. C. Hudson. *Journal of the Iron and Steel Institute*, v. 169, Nov. 1951, p. 250-256.

Report on four types of steel plate used in construction of railroad hopper cars: ordinary mild steel, low-Cu steel, Cu-Mn steel, and Cu-Cr steel. Corrosion data and results of metallurgical examination are tabulated. (T23, S21, R3, CN, AY)

27-T. The Application of Sintered Metal for Clutch Facing. *Machinery* (London), v. 79, no. 2035, Nov. 15, 1951, p. 855-858.

Characteristics and advantages. (T7)

28-T. Metallurgical Considerations in the Use of Aluminium for Cable Sheathing. I. and II. A. Latin. *Metallurgia*, v. 44, Oct. 1951, p. 167-173; Nov. 1951, p. 231-238.

Part I: Availability of materials, production methods, alloy properties, and sheathing methods (extrusion, die sinking, forming, and welding), and special methods. Part II: Properties of drawn and extruded tube, corrosion protection, and joining. (T1, F26, Al)

29-T. Design of Apparatus and Choice of Materials for Refineries. (In French.) *Revue Universelle des Mines, de la Métallurgie des Travaux publics, des Sciences et des Arts appliques a l'Industrie*, ser. 9, v. 94, Oct. 1951, p. 327-336.

Design of columns, heat exchangers, coolers, storage tanks, and piping. Influence of welding problems, service failures, corrosion, etc. on choice of materials. (T29)

30-T. Lithium-Antimony Photo-Electric Cathodes. (In French.) N. Schaetti and W. Baumgartner. *Vide*, v. 6, July-Sept. 1951, p. 1041-1045.

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SALES EXECUTIVE: The man we seek has had a background in metals and metal working. He has supervised salesmen and distributors and is a good organizer. Send detailed resumé stating initial salary requirement. Write: American Silver Co., Inc., 36-07 Prince St., Flushing 54, N. Y.

ENGINEER: A Philadelphia manufacturing concern has position available for an engineering graduate with minimum of five years experience in heat treatment of metals, design and operation of heat treating furnaces. Position involves applying industrial instruments to heat treating operations. Applicants should have interest in instrumentation and electronics. Reply, stating education, experience and personal data. Box 1-5.

METALLURGIST: Recent graduate or some experience preferred in cold rolled, specialty steels and small specialty castings production and development. Metropolitan New Jersey. Please give qualifications and indicate salary desired in first letter. Box 1-10.

CHEMIST: Wanted immediately. College trained with chemical engineering experience to do chemical analyses, both organic and inorganic, connected with processes being developed for special equipment. Some travel required. Mid-Hudson River area. Box 1-15.

RECENT METALLURGICAL GRADUATE: Trained in physical metallurgy, for opening in the research laboratory of a large manufacturer of alloy, tool and stainless steels. Excellent opportunity for professional development. In reply provide usual details including draft status and salary expected. Box 1-105.

SALES AND DEVELOPMENT ENGINEER: Young graduate metallurgist with several years experience in stainless steel manufacturing plant or similar line. Rapid advancement for man with both technical metallurgical and business ability, to sell and service alloys, along with development and research work on new alloys and new applications. Candidate should give complete resume of education, work experience, and several paragraphs indicating why he thinks he is suited for this type of work. Box 1-110.

Midwest

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CHIEF ENGINEER: For industrial furnace manufacturer. Application and information will be held confidential. Box 1-30.

STEEL SALESMAN: For leading toolsteel and specialty mill, midwest territory. Experienced man about 30 preferred. Adequate salary and expenses. Box 1-115.

PRODUCTION METALLURGIST: Recent metallurgical graduate with several years mill experience for process control in mill producing high speed, tool, high-temperature and specialty steels. Excellent opportunity for young man desiring experience in correlation of laboratory developments and mill processing. Give details of education, experience, age, etc. Box 1-120.

EXTRUSION PRODUCTION MANAGER: Experienced, to take full charge of extrusion presses and allied equipment in modern mill. Must have metallurgical background and working knowledge of die techniques. State full qualifications, salary expected and experience. Box 1-125.

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FOUNDRY METALLURGIST: Excellent opening for metallurgical engineer with interest and knowledge of modern research methods in foundry field. Practical foundry background preferred. Excellent opportunity for advancement in expanding organization. Write: Metals Dept., Armour Research Foundation, Chicago 16.

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MATERIALS ENGINEER: Ph.D. in mechanical engineering or physical metallurgy capable of directing research and development on engineering materials problems of petroleum industry operations. Academic or industrial post-doctorate experience desirable. Location, California. Box 1-40.

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DIRECTOR OF RESEARCH OR ENGINEERING: Broad administrative experience to guide your product all the way. Ph.D. degree in applied mechanics of materials, 12 years product development and design. Ten years metals processing and fabrication. Cold extrusion of steel, forming powdered metals, titanium fabrication. Automotive, aircraft, machinery. Knowledge of metallurgy. Box 1-60.

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INDEPENDENT SALES ENGINEER: Covering New York State. Will represent an additional line on manufacturers' representative basis. B.S.E. (AeE) and M.S.E. (AeE) degrees; development engineering, specification writing, purchasing, and sales experience. Only highest quality products, materials, or services for industrial customers will be considered for thorough representation. Box 1-85.

METALLURGIST: Technical degree. Fourteen years diversified industrial experience in heat treating (tools, dies, production items and nonferrous metals), steel specifications, metallography, service failures, supervision and plant metallurgist. Location immaterial. Box 1-90.

METALLURGIST: Stainless and alloy steel. Age 41, B.S. in Chemistry. 19 years experience in metallurgical development and research—physical metallurgy, corrosion, metallography, customer contact, production of strip, bar, and wire. Interested in a responsible position in processing or fabrication with a progressive future. Box 1-95.

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INDEPENDENT SALES ENGINEER: Covering New York State. Will represent an additional line on manufacturers' representative basis. B.S.E. (AeE) and M.S.E. (AeE) degrees; development engineering, specification writing, purchasing, and sales experience. Only highest quality products, materials, or services for industrial customers will be considered for thorough representation. Box 1-85.

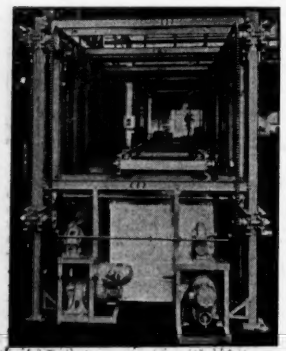
METALLURGIST: Technical degree. Fourteen years diversified industrial experience in heat treating (tools, dies, production items and nonferrous metals), steel specifications, metallography, service failures, supervision and plant metallurgist. Location immaterial. Box 1-90.

METALLURGIST: Stainless and alloy steel. Age 41, B.S. in Chemistry. 19 years experience in metallurgical development and research—physical metallurgy, corrosion, metallography, customer contact, production of strip, bar, and wire. Interested in a responsible position in processing or fabrication with a progressive future. Box 1-95.

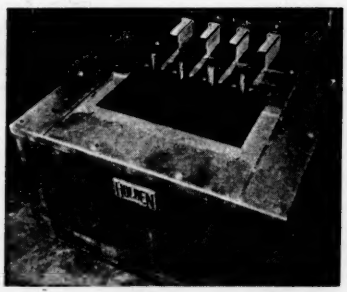
METALLOGRAPHER: Finnish; age 28, married. Six years experience in the most modern research laboratory in Finland. Specialization in structural and physical properties of copper and its alloys. Box 1-100.

HOLDEN POT FURNACES AND CONVEYORS

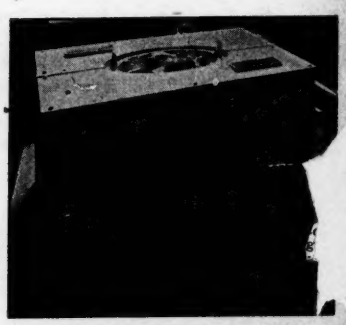
APPLICATIONS – Hardening . . . Annealing . . . Descaling . . . Martempering . . . Austempering . . . Isothermal Annealing and Descaling . . . Stainless Steel Descaling (Sodium Hydride) . . . Sand Removal . . . Bluing . . . Blacking . . . Carburizing



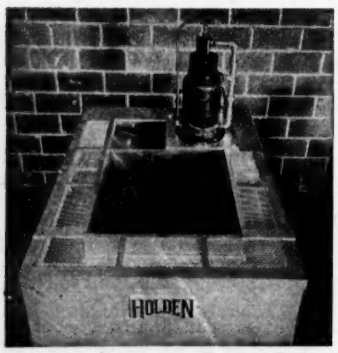
HOLDEN Electrode Furnace with Automatic Conveyor



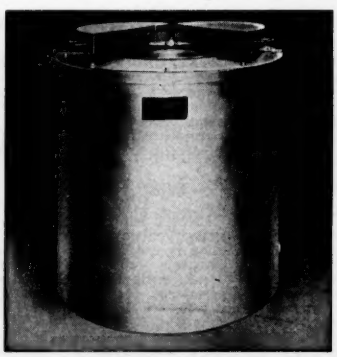
HOLDEN Electrode Furnace



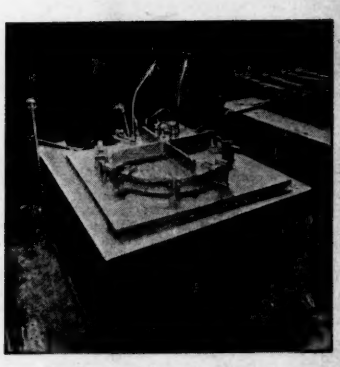
HOLDEN Gas-Fired Furnace



HOLDEN Marquenching or Austempering Furnace— Gas or Electric



HOLDEN Electric Resistance Furnace



HOLDEN Liquid Nitriding Furnace

THE A. F. HOLDEN COMPANY

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New Haven 8, Conn.

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Detroit 27, Michigan